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PETER ZODAC

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CHIPS FROM THE QUARRY

COMING EVENTS

TEXAS GEM SHOW
June 7-9, 1950
El Paso, Texas
Mrs. Kathleen C. Miller, 300 W. Franklin Street, El Paso, Texas, Sec.-Treas.
Rocky Mt. Federation of Mineral Societies, sponsor of Show.

CALIFORNIA FEDERATION COVENTION
June 17-18, 1950
Trona, Calif.
Don MacLachlan, Publicity Chairman, P. O. Box N81, China Lake, Calif.
(See pages 255 and 307)

3rd ANNUAL CONVENTION
American Federation of Mineral Societies
June 28-30, 1950
Milwaukee Auditorium, Milwaukee, Wisc.
Herbert Grand-Girard, Publicity Chairman
817 Mulford St., Evanston, Ill.
(See pages 270, 303 and 335)

BIG POW-WOW IN WASHINGTON
July 1-4, 1950
Vantage, Wash.

Big cooperative 4-day field meeting of various rock clubs in Washington. A small group of collectors, including French Morgan of Washington, D. C., R. L. Sylvester, of Syracuse, N. Y., C. H. Robinson, Sr., of Puyallup, Wash., will meet on June 25th in Payette, Idaho, at the home of Frank S. Zimmerman (425 N. 6th St.) and with Mr. Zimmerman, are to visit a number of localities around Payette and then journey to Vantage.

NORTHWEST FEDERATION CONVENTION
Sept. 2-3, 1950
State Armory, 202 W. 2nd Ave.,
Spokane, Wash.
Columbian Geological Society is host club
Joseph M. Seubert, 1820 W. 26th Ave., Spokane 9, Wash. Chairman of Commercial exhibits.

FIELD TRIPS FOR PENNSYLVANIA

L. J. Duersmith, 933 Spruce St., Columbia, Penn., would conduct a number of field trips in his area if enough collectors would participate. He lives in an area noted for minerals—the limestone quarries of York County, chromite and lead-silver mines of Lancaster County, and the large iron mine at Cornwall, Lebanon County, are but a few of the many good localities in southeastern Pennsylvania which are within easy reach of his city.

The most famous localities in Lancaster County are the Wood's and Line Pits chromite mines which, though abandoned for years, still produce interesting minerals of which gem quality green williamsite is in special demand by amateur cutters.

All collectors interested in the trips, and especially those around Baltimore and vicinity, are urged to contact Mr. Duersmith and to sign up for one or more of them.

Collectors coming from a long distance may make their headquarters in the larger city of Lancaster, which is only a few miles east of Columbia.

REPRINTS AVAILABLE

There have been so many requests for reprints lately that the following bit of information may be of value. They can be supplied and at the following rates:

100 copies	2 pages	$ 3.75
100 copies	4 pages	7.25
100 copies	6 pages	10.25
100 copies	8 pages	12.75
100 copies	10 pages	15.00

All reprints must be ordered in advance, before the articles make their appearance in print.

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MINERALS IN OUR WORLD

By ELMER B. ROWLEY
214 Ridge Street, Glens Falls, N. Y.

Introduction

The writer has long believed there exists a definite need for a comparatively simple, yet reasonably comprehensive story regarding the origin of various mineral species, and why they should be found in all their manifold forms, and oftentimes colorful beauty, within the different geological formations. It is perfectly true this story is related in great detail in many advanced textbooks relating to various phases of mineralogical study, but the writer has no knowledge of any presentation of this subject told as a continuous story, with a minimum of technical terms and phrases.

During the past several years the author has been privileged to be invited to speak to various civic organizations about minerals. Because so many people of completely varied age and interest groups seemed to be fascinated by a general introduction to this story, the preparation of 'Minerals in our World' was conceived and undertaken, to permit more persons who have neither the facilities nor the time to look up all of this information, and weave it into a complete whole for themselves.

The writer is deeply indebted to Mr. Ralph Lapham and Davis Lapham of Glen Falls, for the excellent photographs of various mineral specimens which serve to illustrate various phases of mineralogical deposition and formation. The specimens are from the writer's collection.

How many of us stop to consider what an important role the mineral world plays in our everyday living? Our economic system is based upon a medium of exchange known as money, which in turn is backed by adequate reserves of the minerals, gold and silver. The disintegrated rock masses, called top-soil, on which we walk, build our homes and grow our garden produce is composed essentially of mineral content. The metal containers filled with food on our grocers shelves, the silverware with which we eat that food, the salt that seasons the food, the automobiles in which we ride, the graphite in the pencils we use, are such an accepted and integral part of our daily living we hardly pause to consider the minerals from whence these finished products are derived.

We speak of strategic minerals and the future resources of them. International cartels have been formed to control their production and exploitation. A few specific instances would include the Iranian oil fields—yes, petroleum is considered a member of the mineral family. Also the Saar basin, lying between France and Germany with its vast resources of iron ore and coal. The control of this commercially valuable basin was one of the causes of the Franco-Prussian war in the 1870's. and we all know the attitude of France at the present time towards this vitally important area insofar as that basin fits into the European economy of the future. None of us will soon forget the importance of the seaport town of Narvik, Norway, to the Germans during this last world conflict, as the focal shipping point of the ore from the extensive iron deposits of the central Scandinavian peninsula. At the present time there are expeditions from many of the major countries of the world towards the Antarctic regions in further search for ores of economic value and their possession.

Certainly not least of all is the strict control of uranium producing areas throughout the world, at least until world

conditions stabilize far beyond present conditions.

It is extremely doubtful if there is a living man or woman who has not picked up at some period in their lives a rock specimen of either unusual shape, composition, or color, and asked themselves the 'why' of the formation. This short story is intended to give the amateur mineral enthusiast a speaking introduction to the minerals in our world, with the hope their field trips of the future may be more fully enjoyed.

Most people do not recognize any basic difference between the two words, minerals and rocks, rather accepting them as being synonymous terms. It is only when specific attention is drawn to the tiny particles of various form and character within a rock structure that a definite differential meaning becomes apparent. Those individual particles of varying size and form are known as minerals, and the aggregate mass as a rock. The fullest enjoyment of these inanimate objects is truly realized when we can identify the component rock minerals and understand the partial story of their origin, and the forces which caused their formation.

Certain rock formations are occasionally encountered in the field, within which the mineral grains possess regular symmetrical external form, oftentimes of colorful beauty and structure. These forms are known as crystals, representing the perfectness of nature at her best. All of our knowledge regarding the atomic structural relationship of chemical combination is based on X-ray examination of such natural mineral crystals, developed by Sir William Lawrence Bragg, and his father, of Cambridge University, England. By the same token all the deciphered physical laws controlling the orderly arrangement of matter throughout space, have been interpreted through the application of knowledge developed by the Braggs' research in that field. All this, and much more, from the crystals found in our mineral world. Is it not perfectly natural these crystals should be objects of intense interest to all peoples?

The mineral story is of extreme importance in attempting to understand why minerals occur in the various geological formations, and in the forms we find them.

Mineralogy may be defined very briefly as the study of the minerals found in the crust of the earth, their relationship to each other, and their relationship to the surrounding rocks.

What Is A Mineral?

We may define a mineral as any naturally occurring chemical element or compound formed as a product of inorganic processes. Or, we may say a mineral is a chemically homogeneous inorganic substance, which can be expressed in a chemical formula. Normally a mineral is composed of nearly constant quantities and proportions of its component elements, though variations often occur, owing to included impurities.

The mineral quartz is a good illustration of such a combination of chemical elements, where one atom of silicon and two atoms of oxygen combine chemically to form one molecule of quartz, expressed in the chemical formula SiO_2.

However, in our observations of the various members of the quartz family of minerals, we find chemically pure quartz, SiO_2, only in the colorless rock crystal variety. All other members of the quartz mineral family contain included quantities of various chemical elements as impurities, to either a greater or lesser degree. For example, amethyst contains minor quantities of included fluorine. Ferruginous quartz of varying shades of red and brown may contain either ferric or ferrous iron. Smoky quartz with a color indicative of its descriptive name, may owe its particular shade and depth of color to either inclusions of carbon, or be the product of exposure to radioactive emanations from the rocks in which it is found. Rose quartz owes its color to minor quantities of included manganese and/or titanium salts. Yet in spite of the wide range of foreign chemical inclusions, the formula for the entire quartz group remains SiO_2.

It is apparent, therefore, the many

different mineral species owe their present chemical structure and form to the chemical content of their original fluid or plastic magma, and the physical conditions under which they were deposited. Minerals of one variety or another are found in all types of geological formations. The actual process of formation and deposition may be the result of either precipitation or evaporation from a supersaturated solution; the intermingling of more than one type of solution; by normal chemical reaction between the wall rock and the percolating solution; or from chemical reaction produced by excessive pressures and high temperatures from mass rock movements of the earth's crust.

Two Main Types of Mineral Deposition

Minerals are said to be a result of primary deposition if they still retain their original character and relationship to the adjoining rocks. If there has been any alteration, either mechanical or chemical, since they were deposited as primary minerals, the process is referred to as being of secondary character.

Primary Deposition

The first rock masses of our earth were the result of hot fluid magmas being expelled from its intensely hot interior, through fissures and vents of the crust, and there exposed to the cooler atmosphere, they cooled and hardened.

In our consideration of the process of primary deposition let us consider the space beneath the outer crust of our earth as a vast natural laboratory, in which the elements are contained in a heavy, dense solution, but owing to the tremendous downward pressure of the superimposed rocks, appear to be in a solid state. Through contraction, or shifting of land masses on the crust, that pressure may be released. The release of pressure allows the solid matter to expand. With the expansion of the dense and compacted magma the solid matter becomes a semi-fluid or plastic mass generating extremely high temperatures through increased chemical activity of its included gases. In that physical state the elements have freedom of motion and are more or less free to circulate about. The combination of heat and expansion owing to loss of pressure, forces those magmas to seek ingress into and between the weaker layers of buried rock, and egress to the earth's surface through the fissures and gas vents in the crust. When those hot magmas cool, the circulating elements combine, not only with their component magma elements, but also under the proper conditions with some of the atmospheric elements. The minerals formed from those combinations are known as the rock-forming minerals. It is those minerals which make up the original and oldest rocks of our earth's crust.

When we consider that the original igneous rock masses are so deeply buried in the crust of the earth that at no place on its surface has the bottom layer ever been uncovered, we gain a faint impression of the titanic forces at work during the formative period of our earth's geological history, and the millions of years this activity must have continued. Some of those flows have been found to be several thousand feet in thickness and many thousands of square miles in area. Our own northwestern states of Oregon, Washington, northern California, and southwestern Idaho are blanketed with such beds, in places exceeding 5000 feet in thickness. The Snake and Columbia Rivers have cut their courses through these exceedingly hard rocks. Western India, the British Isles and Iceland are likewise the remnants of vast plateaus of that age.

The rate of cooling is a most important factor in influencing the physical texture and appearance of those rocks. When the fluid or plastic magma cools, a temperature is reached at which some of the constituent chemical elements will begin to separate out of the hot solution as crystals. The more non-volatile substances are represented in this initial crystallization. Crystals are the result of an orderly chemical combination which presupposes the existence of a magma sufficiently fluid to permit the circulating molecules adequate freedom of movement to pro-

perly orient themselves. When a hot magma cools very quickly the physical condition of the solution changes from a mobile liquid to a sluggish, viscous mass which completely prohibits an orderly arrangement of its constituent molecules to form crystal grains, and the glassy rocks will be formed. These include the obsidians and trachytes. When those viscous magmas enclose excessive quantities of gaseous material, the rock formed will usually be light and frothy in texture. Scoria and pumice are the products of such inclusions.

In those magmas of intermediate cooling phase, crystal grains may start to develop throughout the entire mass, yet in such close proximity that they will interfere. The rocks formed within these zones of crystallization will be either fine-grained or coarse-grained in texture. The granites, granodiorites, diorites, diabases and porphyritic rocks would be included within this group. Generally speaking, the slower the cooling process, the coarser the rock grains will appear. In some instances though, the presence of various quantities of included volatile gases such as water vapor, carbon dioxide, sulphur, fluorine and chlorine increases the mobility of those magmas and retards the rate of crystallization process. These gases perform much the same function as that produced by a slowly cooling magma. See further remarks regarding this phase under the crystallization of porphyritic rock structures.

Igneous rocks are classified according to their textural characteristics. If the individual mineral grains can be seen easily with the naked eye the rock is referred to as being 'granular.' This term is further modified by descriptive prefixes such as, 'fine-granular', 'even-granular,' 'coarse-granular,' etc. A 'dense' rock is one in which the grains are nearly invisible. 'Porphyritic' structures refers to those igneous rocks containing one, or possibly two, minerals which stand out conspicuously against a very fine grained 'aphanitic' background called 'groundmass.' The prominent minerals in a porphyritic rock are called 'phenocrysts.' When all of the individual mineral constituents in an igneous rock are very large, the formation is known as a 'pegmatite,' and the rock structure is called 'pegmatitic.'

Dark colored aphanitic rocks are referred to under the broad and general classification of either basalt, or diabase. The light colored rocks of comparable texture are called 'felsites.'

The three photographs under Fig. 1 illustrate rocks formed by three phases of differential cooling. Obsidian, or volcanic glass, represents the first phase where the cooling has been so rapid that this 'glassy' substance is the result. The specimen of granite is representative of the second phase where the individual crystal grains of quartz, feldspar and hornblende started to develop but overlap one another. The texture would be referred to as 'even-granular.' The final phase in which the rate of cooling and crystallization has been a very slow and delayed process is graphically portrayed in the specimen of quartz containing a perfectly developed crystal of black tourmaline. The texture would be 'pegmatitic.'

How can a rock produced from igneous activity of primary deposition be recognized in the field? Normally, the textural character of an igneous rock has the same appearance in whatever plane of observance the specimen may be held. There is no linear character of mineral grains, such as one finds in rock structures which have been subjected to metamorphic activity. Metamorphism means literally 'change in form' brought about by great pressure and increase in temperature, neither physical property being needed to form rocks from igneous magmas. In fact as observed, the process is one of decrease in both pressure and temperature. Neither do we find parallel bedding planes such as are quite evident in those rock formations deposited by sedimentary processes.

Those minerals found in the igneous rock formations and the order of their deposition varies widely. There are many contributing factors, such as, the chemical

content of their original fluid melt or magma solution, its viscosity as regulated by the presence of volatile or non-volatile substances and the rate of crystallization as controlled by temperature and pressure conditions, each plays its own vitally important role. Some of these factors may combine and act as a single unit. Neither is the order of deposition sequence an uninterrupted process, as the composition of the magma changes periodically with partial crystallization, resulting in entirely new chemical processes and reactions with those minerals already deposited, dissolving some and redepositing others. The deposition of olivine represents a good illustration of such a subsequent change, when, under the proper conditions, the remaining fluid magma may react with the olivine to form the pyroxene mineral, clino-enstatite.

Gravitation also plays an important part in the separation of some of the heavier chemical elements as they crystallize from the melt to form mineral compounds. Lenses and beds of important magnetic iron-ore deposits may result from gravitational magmatic segregation. Some of the titaniferous-bearing iron deposits may also owe their origin to this form of natural separation. Consequently, we find the more basic rocks of dark color, rich in iron and some of the heavier elements and with a low silica content lying below those lighter colored acidic rocks having a high silica content. This statement does not take into consideration mass rock movements or displacements in non-conforming relationships.

Rock Forming Minerals

The rock-forming minerals are relatively few in number but include as its

Fig. 1 (a)

Glassy obsidian (Igneous primary deposition).

most prominent members the feldspars, pyroxenes, amphiboles, olivines, micas, quartz and the iron ores. These minerals are present in the older rocks such as basalt, diabase, gabbro, diorite, granite, granodiorite, syenite, felsite and rhyolite as granular crystalline particles of varying size, usually very fine to medium. It is only in the rocks of pegmatitic origin and structure, those of very slow and delayed cooling processes, that well formed crystals of the various mineral species are found.

Crystallization processes within both pegmatitic and porphyritic rock structures modify this statement. In pegmatites the presence of numerous volatile mineralizing gases may delay the crystallization process, while in the porphyries the basic magmas being more mobile than the acid magmas probably contributes much to their rate of crystallization. In either event the process is comparable to a slow rate of cooling.

Pegmatites

Pegmatites are irregularly shaped intrusive bodies formed when hot igneous magmas push into and between the weaker rock layers and zones far beneath the crust of the earth. Usually a pegmatite vein or dike, pinches and swells in relative conformity to the pre-existing contour of its matrix cavities, and the chemical content of parent wall-rock. Because some rock structures are more easily affected by intrusive bodies the chemical content of the country rock is a major factor. Their chief characteristic is the very coarse structure or crystallization of the minerals contained within the dike,

Fig. 1 (b)

Even-granular hornblende granite.

some of them forming crystals of tremendous size. Single mica crystals up to 10 feet in diameter have been found in the pegmatites of India. A single beryl crystal 18 feet in length and 4 feet in diameter weighing some 18 tons was found in one of the Maine pegmatites. A quarry in Russia was contained within the boundaries of a single feldspar crystal. This very coarse crystallization is brought about mainly by the properties of included mineralizing gases which decrease the viscosity of the magma and permitting a slower and more orderly alignment of the circulating molecules. Pegmatites are, therefore, a fertile collecting ground for all mineral collectors. Many of the rare-earth minerals are often found in association with the more common pegmatite minerals, feldspar, quartz, mica, beryl, tourmaline, etc.

Pegmatites are always younger than the geological formation they intrude.

The sequence of crystallization within pegmatites vary. The original minerals always include members of the feldspar family, chiefly microcline, with subordinate quartz either as single interlocking crystals, or intergrown to form graphic granite. It is highly probable there is a later succession of replacements and recrystallization throughout the pegmatite producing first albite, then mica, tourmaline, beryl, garnet, topaz, fluorite, spodumene, amblygonite and finally some of the rare-earth minerals such as samarskite, columbite, tantalite, aeschynite, microlite, gadolinite and others.

Mineralization of pegmatites is not limited to the liquid magma melt alone. Most fluid or plastic magmas exist in a state of high temperature accompanied by many volatile gases such as water vapor, and compounds of various elements such as fluorine, boron, chlorine, phosphorus and others. These mineralizing gases penetrate the porous rocks far beyond the rock walls of the cavities or fissures actually exposed to the circulating solutions. The degree of penetration

Fig. 1 (c)

Pegmatite. (Note the nice black tourmaline crystal in quartz.)

and mineralization is governed by two factors. The extent of intrusive activity, and the type of rock structure exposed to that intrusion. The volatile gases, or mineralizers, recrystallize to either a greater or lesser degree, the minerals exposed to them, thus forming new mineral varities.

Such of the gases as are not expelled from the magma during the cooling and recrystallization phase may enter either into chemical combination to form rock-forming minerals, or be retained within those minerals as gaseous inclusions. The movable bubbles in quartz crystals are representative of this type of imprisonment within the crystal structure itself.

The order of crystallization from igneous intrusions other than those described under pegmatites varies widely. The more basic elements are normally the first to separate out of the magma melt, leaving a progressively richer concentration of the acid magmas for final crystallization.

Secondary Processes of Mineralization

Those minerals of secondary origin are the products of three different processes, Precipitation, Metamorphism, and Evaporation. However, they do not contain any new elements not found in the primary minerals, and represent therefore, a molecular rearrangement only of those existing elements.

Precipitation

Minerals formed as a result of secondary precipitation processes may originate by the filling of a fissure which may be the product of faulting activity, or by more or less replacement of existing open spaces such as vein openings, or solution cavities in rocks of various formations. Fissure veins, gas cavities in lava flows, geodes of a few inches in diameter or large solution caves, may be enriched as a result of precipitated mineral deposition. The solid rock formations may also be secondarily enriched through a process of mineral replacement by simultaneous solution-precipitation, known as metasomatism.

All of the surface waters on our earth either drain off by our river systems into the oceans, or seep down into the mantle of soil, eventually finding their way into the porous rocks, fissures and crevasses of those rocks beneath the mantle soil. The average increase of temperature as we descend into the earth approximately 1 degree F. for each 100 feet of penetration.

At some unknown depth, naturally varying widely in different sections of the world, those saturated percolating waters become so hot they begin to rise again towards the earth's surface. Again

Fig. 2

Secondarily capped quartz crystal.

they seek the easier pathways upward—the fissures and cavities in the rock—and as the ascending waters cool, with an accompanying decrease in pressure, the elements carried in solution, combine, according to their respective chemical attractions, and crystallize out of the solution, depositing themselves along the rock walls of those existing fissures and cavities. If those open spaces are exposed for long periods of time to such supersaturated solutions, crystal caves of various mineral species such as calcite, marcasite, galena, sphalerite, fluorite, and many others may result. On the other hand certain secondary mineral-bearing solutions may attack the precipitated minerals already lining the cavity walls, removing some of their component elements in solution and precipitating new ones. Again, the precipitation process may cease, and at some later date be exposed to a similar mineral-bearing supersaturated solution, and the newly precipitated mineral may build up the existing crystals by following their exact crystal form and habit. See the crystal of quartz in Fig. 2, which is capped by a secondary crystal of quartz as a result of this form of regenerative process. Fig. 3 represents a miniature cave known as a geode, the inside walls of which are lined with quartz crystals deposited there by precipitation from a supersaturated solution. Crystal-lined geodes are the result of small solution cavities being first sealed off by the precipitation of layers of silica capturing a quantity of the parent solution in the process. The slow precipitation of the imprisoned solution produces the crystalled-lined interior. Fig. 4 illustrates precipitated crystals of calcite and quartz lining the side walls of an open vein in dolomitic limestone. A quartz crystal group is shown in Fig. 5. It too is a product of precipitation.

The composition of completely filled precipitated mineral veins is varied, but some of the more common minerals would include quartz and calcite. Those veins containing economically valuable ore-bearing minerals, usually consist of one or more minerals of commercial value in association with other minerals having

Fig. 3

Quartz Geode. (Broken open to show its interior.)

little or no value. Gold, Copper, Silver, Lead and Zinc may be present in such veins in many different combinations. See Fig. 6 for a representative precipitated mineral vein of this latter type.

Proof that mineral deposition in veins is a result of precipitation from supersaturated solutions becomes quite evident when a cross section of such a vein is examined. The exact sequence of mineral formation is duplicated along each opposite side wall, and continues to the center of the vein. In Fig. 6 the side walls of the veins are lined with calcite, with a vein core of native silver and smaltite in a matrix of dolerite-porphyry.

Metasomatism

All types of rock structures and their mineral constituents are subject to alteration and replacement processes through the action of circulating ground waters. The process is known as metasomatism. Very ready evidence of replacement after an original mineral or rock material is shown by the many types of pseudomorphic structures found in the mineral world. Silicified and opalized petrifications of wood structure, dolomitic limestone replacing calcium carbonate limestone, many pseudomorphous replacements after an original mineral crystal, such as limonite after iron pyrite, chlorite after garnet, quartz after calcite, represent but a few typical examples of this type of alteration. The actual change in

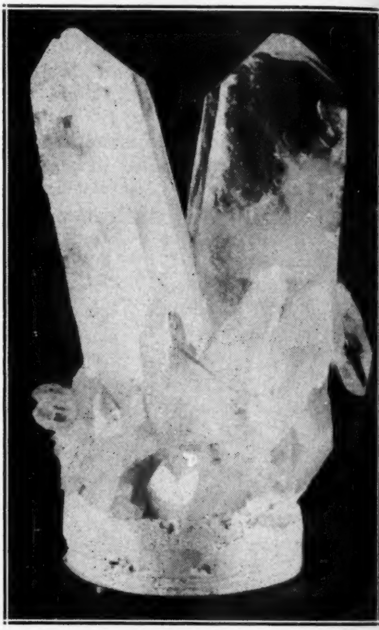

Fig. 5

Quartz Crystals.

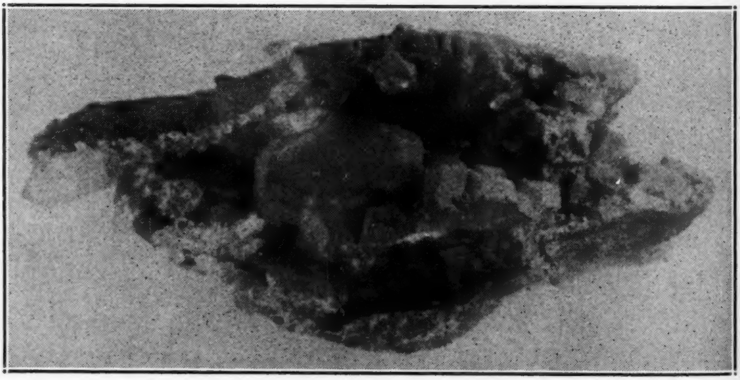

Fig. 4

Quartz and Calcite crystals in open vein.

form may consist of substitution of one or more minerals replacing one to several original minerals in the host rock, without any chemical reaction between the replacing solution and the replaced substance or substances, or it may be a product of pseudomorphous replacement brought about by a change in the chemical composition of the percolating solutions, or one involving a chemical reaction between two or more substances resulting in the dissolution of some of the component parts and the precipitation of a new material. Many of the secondary minerals found in the metamorphic rocks are formed as a result of metasomatic processes.

Metasomatic alteration becomes possible when either the forces of replacement can overcome the forces of restricting pressure, or in the case of dense rocks make space available for precipitation of the new material by simultaneous dissolution of the old.

Because of these various circumstances, mineralization by precipitation from a solution is not limited to the confining space offered by open veins and cavities within the rock structures. The circulating waters in the rock crust are forced by the exceedingly great pressures under which they exist, into even the tiniest of capillary fissures, and from them into the rock structure itself. Precipitation will take place directly from the circulating solutions along the side-walls of the open spaces through which the solute body is moving, while metasomatism will occur in the adjacent country rock, and in those completely filled mineral veins which are the result of previous precipitation processes. The amount of metasomatic activity is dependent upon several contributing factors. The pressure of the solution, its chemical content and the density of the rock would be of major importance. While no type of rock structure is impervious to these replacing processes, the basaltic and felsitic rocks would not be as readily attacked as such formations as the limestones and schists. The parallel layers of schistose rocks represent weaker zones of lesser density which permit the easier circulation of ground waters through those layers.

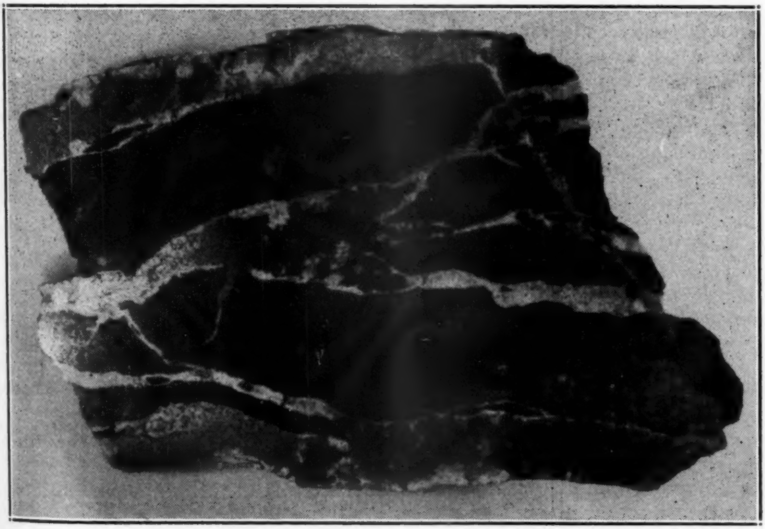

Fig. 6
Completely filled precipitated Mineral Vein.

Mineralization from metasomatic forces is made possible by the replacement of one or more existing minerals in the host rock, through nearly simultaneous processes of solution and replacement. The complete transformation and replacement is dependent upon two factors. First, there must be a steady replenishment of the solvent material, and secondly, an opportunity must exist for the dispersion of the dissolved material.

The circulating hot waters which penetrate the rocks exposed to them, partially decomposes and adds into the solution some of those dissolved elements or materials. If the forces of dissolution exceed those of replacement, or if the replacing mineral substance takes up less volume of unit space, such as $MgCO_3$, dolomitic limestone, when it replaces $CaCO_3$, the calcium carbonate limestone, solution veins and cavities will result. If on the other hand the forces of dissolution-replacement are in equilibrium the mass volume of the rock will remain unchanged owing to the great pressure of the solution.

The actual process of transformation is made possible by the property of gaseous or solvent molecules to adhere to a solid surface which brings about an increase in the concentration of the solution on that surface. This is known as adsorption. The resultant supersaturation of the very thin liquid films along the frontal-zone of the permeating solution creates possible chemical activity along that front. Whenever adequate space becomes available new substances precipitate out of the solution as crystal grains and the supersaturated 'front' advances. If the crystallization of the newly precipitated substance continues, the process of solution is materially increased along those directions of pressure corresponding to the combining forces of crystallization. In this manner crystals may develop within those rocks which are attacked by such permeating solutions, and because the development of crystal grains may start at many places throughout the host formation, the resultant rock may have many perfect crystals of the replacing minerals disseminated throughout its mass. In other instances the replacing minerals may develop into crude and irregular granular masses. When crystallization ceases, the dissolving activity of the solution may still continue in planes parallel to the crystal faces, resulting in the precipitation of the next available material. The very thin films of chloritic material which surround the iron pyrite and magnetite crystals in the prochlorite from Chester, Vermont, are representative of this 'fill-in' precipitation material. In no instances of this type of mineral replacement can one find any space between the replacing mineral and its host formation. Metasomatic crystals of iron pyrite in prochlorite, or green chlorite schist, probably after calcite, are shown in Fig. 7.

Metasomatic processes of replacement are responsible for the many solution cavities within which the magnificent Little Falls "Diamonds," or quartz crystals, are found. The parent rock was calcium carbonate limestone which has been transformed by percolating waters rich in magnesium to dolomitic limestone, forming the Little Falls Dolomite series in New York State. Magnesium takes up less unit volume of space than does calcium, and the replacement has produced a consequent shrinkage of the parent rock. Without doubt the cavities have been enlarged by the solvent action of subsequent circulating solutions. The quartz crystals found within those vugs are precipitated from those latter circulating solutions and are not a product of transforming metasomatic forces.

Precipitated Ore Bodies

Precipitated mineral veins, ore lenses and beds are often times enriched by secondary mineralization processes, producing veins and beds of great economic value.

Certain types of surface ore deposits owe their richness of ore content to various processes of secondary enrichment, brought about by the weathering action of circulating ground waters. The upper zones of those deposits are attacked by the percolating waters which

dissolve some of the elements in solution and carry them downward to redeposit them as precipitates in the lower zone levels. In some instances the process of redeposition ceases at the level of the ground water table, but in others may extend to considerable depths below that level. Fluctuating changes in the ground water level probably contributes much towards this factor of redeposition depth.

Those ore deposits containing a preponderance of metallic sulphide minerals are less readily changed by replacement processes of secondary mineralization, than are the sulphide-free deposits. In both types, however, the length of time necessary to accomplish an extensive replacement and enrichment, is measured in terms of geological epochs, not in terms of a few thousand years.

The two main chemical changes within an ore body are oxidation and hydration. The alteration of sulphide-free deposits is relatively simple. The surface material exposed to normal erosive and corrosive weathering agencies undergoes a gradual process of disintegration, followed in progressive order by partial dissolution in the circulating waters, then oxidation and/or hydration of the weathered body. The zone of weathering is referred to as the gossan.

Certain rock series are more easily attacked and altered by the chemical action of percolating waters rich in oxygen, than some other types. They include the carbonate rocks rich in some of the metallic elements such as iron and manganese. Thus, deposits of siderite, the iron carbonate mineral, may be reduced by the chemical action of the oxygen-rich waters, to limonite, the hydrous oxide of iron. Likewise, rhodochrosite, the manganese carbonate, may be altered to pyrolusite or manganite, the manganese oxides, under similar conditions. Beds of ferruginous chert when exposed to circulating waters rich in silica may be changed in whole, or in part, to rich concentrated bodies of hematite, the red oxide of iron. Rich concentrations of the copper carbonate minerals, malachite and azurite, are formed when native copper deposits are exposed to such secondary mineralization process. In the presence of a sulfate solution the secondary copper mineral, chalcanthite, may be precipitated.

Within the metallic ore deposits, those rich in the sulphide minerals, the degree of change is still more rapid than in

Fig. 7

Metasomatic Iron Pyrite Crystals in Prochlorite.

the non-metallic minerals of the country rock which encompass them, although not nearly as rapid as the alteration in the rock series described in the foregoing paragraph. As a general rule the rock-forming minerals are more impervious to the leaching action of the circulating water than are some of the metallic minerals. Consequently, the direction of change will be confined within the boundary limits of the ore-body, and the sequential order of change will follow a progressive pattern from the top of the ore body to its base.

The chemical processes of both oxidation and hydration do not react equally with all of the elements which may become exposed to the action of the circulating waters within the original ore deposit. Some of those elements are more resistant to chemical alteration than others, and the resultant change within the ore-body would be the removal in solution of the more worthless constituents, and the enrichment, through concentration, of the remaining valuable mineral compounds.

The soluble compounds leached from the gossan are eventually redeposited in the lower zone levels as mineral sulphides of low grade ore. The per unit value of the ore minerals in the lower zone levels decreases progressively with increase of depth. Presumably these processes of secondary enrichment of both surface metalliferous and non-metalliferous ore bodies, and subsequent mineralization of lower zone areas are repetitive. There would be two factors involved. Recurrent denudation of the buried ore-deposits by forces of various weathering agencies such as erosion and corrosion, followed by a sufficient time factor to permit the slow permeation of those beds by circulating waters and the subsequent chemical changes.

The once rich copper carbonate deposits in Arizona lying in the upper zone, and containing a metallic copper content as high as 57%, have been practically exhausted. The minerals in this zone were chiefly azurite and malachite as carbonates of copper, cuprite as copper oxide, and native copper. Present mining operations are being conducted in the lower sulphide-rich zone of secondary enrichment, producing only low grade ore, contained in the minerals chalcopyrite, chalcocite, bornite, etc. Yet, if the weathering processes of percolating waters in the gossan had not taken place, even those low-grade ores would be non-existant. The extensive Mesabi Range iron ores in Minnesota lie in the upper zone of secondary enrichment brought about by the removal of the worthless ore-body constituents, as a result of the weathering action of the circulating waters within the ferruginous chert beds from which they were leached, leaving a fabulously rich concentration of hematite, with minor quantities of included limonite and goethite. When this rich capping of concentrated iron ore has been exhausted, mining operations and processes at that locality must either be re-adapted to the recovery of the lower zone ores of low grade, or the locality will be abandoned for some more easily recoverable ore-body elsewhere. It is quite evident that at the present rate of consumption of known metallic ore-bodies, it will become increasingly necessary to drive deeper mine shafts into the lower grade ores of the sulphide zones. How this will affect future mining and manufacturing costs remain to be seen. Perhaps the newly prospected iron ores in Labrador may delay this critical period to some unknown later date. If the low grade iron mineral, taconite, with a content of 24 per cent iron, compared to the 52 per cent content of iron in the present Mesabi ores, can be smelted into pig iron on an economic basis, the critical period can be further delayed, as vast quantities of taconite are available in the Lake Superior region. Sooner or later, however, the problem of locating new ore-bodies of economic value is an issue which must be met squarely by the members of the mining engineering fraternity.

Metamorphism

Another major source of mineral formation and deposition is a result of metamorphic geologic activity brought about by mass rock movements on, or near, the

earth's crust.

The rocks comprising the outer crust of our earth are under constant forces of strain and stress owing to shifting of the eroded land masses on the surface. Removal of rock materials by erosive and corrosive agencies lightens the earth load from any single area, while the transporting agencies of wind and water carry them outside of the area to build up additional surface weight there. The underlying rock structures, which are actually the building girders of our earth and serve to hold it rigid, try to adjust themselves to those shifting masses. Within certain limits of elasticity they are able to maintain a static equilibrium. If the load shifting continues, a point is reached beyond which the rocks cannot cushion the strain by further bending, and they snap apart with a sudden break and move to new positions until the causative strain has been alleviated. and the forces of equilibrium are satisfied.

The friction produced by the two adjacent land masses moving simultaneously in opposite directions, or even if one mass remains static in relation to its adjacent moving mass, generates extreme heat and pressure. The exceedingly high temperatures generated by such friction creates extensive chemical action on both sides of the contact between the two masses, resulting in a recrystallization of the existing rock masses into entirely new combinations of mineral species and rock formations. This type of mineralization is called dynamic metamorphism. If the rock movement is local in character it is referred to as 'regional metamorphism.' If the movement is extensive in scope—'diastrophism.'

Another form of metamorphism activity involving no rock mass movement is known as load metamorphism. This type of change is produced through compression of sedimentary rocks resulting from an excessive load of superimposed rock material. The pressure of those overlying rocks generates heat in the deeply buried sediments, resulting in the recrystallization of the materials included in them. Compaction of those sediments without deformation of the rock structure is the natural result. Sandstones, limestones and shales are a product of load metamorphism.

Degree of Metamorphism

It is quite obvious there must be a degree of comparable metamorphism of the adjacent country rock from three different sources. First, from igneous intrusions of primary deposition, secondly from precipitation processes of secondary deposition and thirdly, from mass rock movements on the crust resulting in extensive folding and faulting activity. The degree of metamorphism is controlled by the extent of contributing cause.

Contact Metamorphism

Igneous intrusions of primary deposition sources may range from tiny veinlets and stringers within minor rock formations, to vast and extensive intrusions forming laccoliths, batholiths, volcanic necks, and dikes, disrupting geologic formations over many square miles of territory. The massive anorthosite dike which disrupted and now occupies the whole central Adirondack Mountain range, is an excellent illustration of such a major intrusive activity. The degree of metamorphism resulting from such an intrusion would very evidently be of considerable consequence. The combination of the excessive heat generated by the invasion plus the nearly limitless quantities of mineralizing gases present in the magma melt has resulted in a recrystallization of the adjacent country rock for many miles in all directions.

The actual amount of recrystallization resulting from primary mineralization of veins produced by precipitation processes is probably quite limited. In the lower zones of exposure to the solutions of high temperature there is no doubt a limited amount of side-wall penetration from the mineralizing gases, producing a certain degree of recrystallization. Mineralization of the middle and upper zone areas exposed to primary circulating solutions is probably limited to surface, or near-surface activity. However, secondary circulating solutions can, and do, effect extensive recrystallization of vein and cavity minerals actually exposed to the

percolating waters, and through metasomatic processes both primary and secondary solutions will affect to either a greater or lesser degree the adjacent country wall rock.

Dynamic Metamorphism

Major mountain making epochs such as those which accounted for the massive Appalachian upheaval in the east, the Rocky Mountain upheaval in the west, and such minor epochs as the Adirondack emergence from sea-level or lower, in Pre-Cambrian time, and the Taconic emergence in western New England, contributed to the recrystallization of all parts of the emerging masses of rock, and to vast areas of adjacent country rock.

Metamorphism produced by such crustal mass-rock movements is very extensive. These major epochs twist, push, contort and fold sedimentary rock materials into high peaks, see Fig. 8, and intervening valleys, generate high temperatures and pressure in the process, and produce entirely new minerals and rocks. The crushing pressure of the earth movement forces the mineral particles into flattened parallel planes perpendicular to the direction of greatest force. The parallel laminated structure of metamorphic rocks is one of their most striking characteristics.

The new mineral species produced from these metamorphic processes is dependent upon the chemical content of the original rock material. Impure limestones will produce many varieties of mineral species. Graphite will be the crystalline counterpart of fossil and organic remains within the parent limestone. Combinations of lime, magnesium and silica will produce pyroxene. Lime, silica, iron and water will produce garnet. Some of the more common minerals produced by metamorphic processes would include the pyroxenes as augite and diopside; wernerite, vesuvianite, quartz, tourmaline, mica, magnetite, hornblende, epidote, chlorite, and serpentine.

Localized faulting activity will produce a certain amount of recrystallization in the adjacent country rock, but not usually to any appreciable degree. In this type one would expect to find fault breccia, or recemented masses of irregular shape broken from the parent rock, with possibly a partial metamorphism along the plane of movement. There may also be a displacement of wall rock material in the direction of the fault movement caused by 'drag' of the rock at the time of faulting.

Evaporation

Mineralization of salts from evaporation processes becomes possible whenever sufficient water contained within inland basins evaporates to produce a supersaturated condition of the remaining saline solutions.

If we should place a concentrated solution of common table salt and water in a dish, and allow the water to evaporate, we would have crystals of salt left in the dish. On a large scale that exact process has been duplicated by nature many times during the geological periods preceding our own. It is apparent, however, that the minerals evaporated from solution as a result of natural processes, would include not one mineral species, but all types of minerals intimately associated, which are the product of evaporation. Very rarely, however, do we find deposits containing a complete series of evaporated salt minerals. The only important localities where a nearly complete series has been deposited are at the extensive salt and potash deposits in East Prussia and near Carlsbad, New Mexico.

The surface waters which are constantly scouring the face of the earth erode and corrode the rocks with which they come in contact. For very ready proof of this statement examine the surface of any limestone outcropping and notice how the action of dilute carbon dioxide in the rain waters which have pelted the exposure, has dissolved minute quantities of lime and left tiny solution pits. The soluble salts leached out of those rocks are carried in solution in the water, and are eventually emptied into large inland basins, or the oceans. Some of those inland basins may later become shut off from the sea, either through the raising of land forming a barrier, or through

natural land barriers formed by water action. With the outlets of those inland basins closed, the degree of concentration of the saline solution increases, until the salts crystallize out of the supersaturated solution in the order of their solubility and sink to the bottom of the inland sea. There they are covered by layers of silt and mud brought in by successive flood stages of the rivers, that sequence continuing until the rivers draining into those basins either cease to exist, or drain in a different direction, resulting eventually in the complete evaporation of all waters contained within those land-locked lakes or seas. The valuable halite salt beds, extending across the great central plain of New York State are a result of this type of secondary mineral deposition. The salt flats around Great Salt Lake in Utah are the product of such an evaporation process, from a once great inland sea whose drainage rivers have ceased to exist. If present conditions continue there, the complete evaporation of all its contained waters will be a certainty, leaving in its place the evaporated salts now contained in solution within it.

There are many contributing factors in the crystallization of minerals by evaporation from a saline solution. Temperature, pressure, time, degree of concentration, and solubility of the contained salts, are all vitally important. The saline content of the solution plays an equally important role, as the mineral series produced from a double-salt solution will differ from those produced from a single-salt solution. The least soluble salts are the first to separate out of the solution as crystal molecules. The most soluble salts represent the last separation.

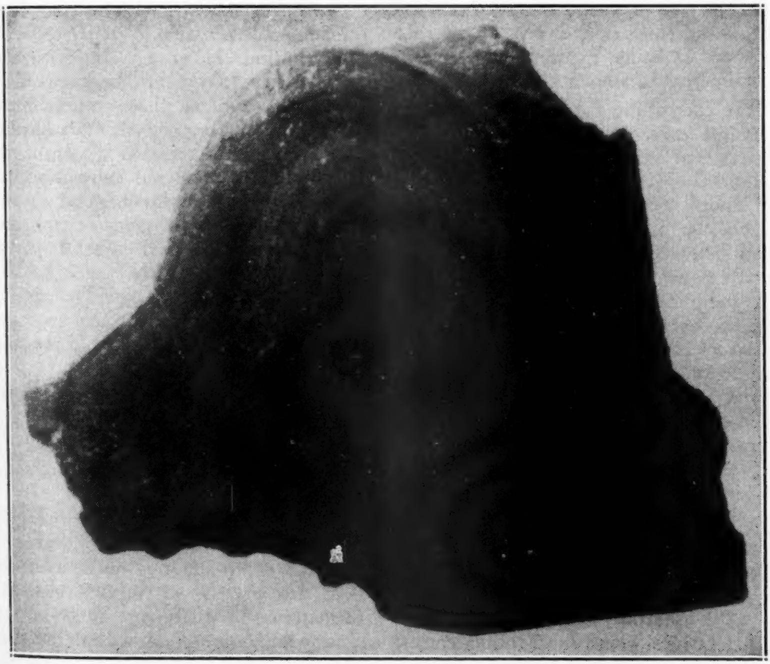

Fig. 8

Metamorphism (Contorted mica schist)

The saline concentration may be, and often is, interrupted at intermittent intervals by prolonged periods of excessive rainfall causing vigorous drainage into the water basin, and a general disturbance of its contained waters.

Vigorous and swift-running rivers produce active scouring action of the river beds and adjacent banks through which they pass resulting in those river waters carrying quantities of silt and mud which become interbedded with the various salts already deposited on the basin floor. The frequency and duration of such disturbing influences retards the amount of evaporation and the resultant thickness of the saline beds. On the other hand long periods of quiescent inactivity within the water basins may stimulate precipitation of the salts contained in solution to produce thick beds of interlaminated saline minerals. Usually the salt minerals are interbedded with both soft shales and limestone, and often alternating beds of halite, gypsum and anhydrite contain varying amounts of clay material.

The controlling factor is of course. the chemical content of the solution. Carbonates of calcium and magnesium, sodium chloride and the calcium sulfates are among the first combinations to crystallize out of the solution. Because of continually changing conditions of temperature, degree of saline concentration, etc., the mineral separation is an alternating process, resulting in the deposition of layers of first one salt, then another, and so on. The actual separation of the crystal molecules may be quite complicated by the crystallization of double, or even more complex salt combinations.

The more common minerals would include halite, as sodium chloride, gypsum the hydrous calcium sulfate, and anhydrite the anhydrous calcium sulfate. The potassium-magnesium chloride salts are usually the end series to crystallize from the solution.

In locations where the deposits consist chiefly of one mineral series such as halite, it is probable a change in the physical conditions within the basin prevented a successive evaporation of some of the associated salts such as gypsum and/or anhydrite. Either climate or drainage changes, possibly both, could be that cause.

The thickness of a single salt bed is dependent upon the time factor of undisturbed crystallization. If ideal conditions of crystal separation by evaporation processes from a solution were to continue over long periods of time, say one million years or more, a constant separation of salt minerals would result. Those conditions would require a constant and steady replenishment of the saline material within the basin, at a rate equivalent to the amount being precipitated. Climatic conditions would have to be exactingly stable. For example, precipitated gypsum may be altered to anhydrite, as they sink through a sodium chloride solution with only a relatively few degrees of temperature drop.

Normally anhydrite is the first of the calcium sulfate salts to separate out of the solution. However, anhydrite alters very slowly to gypsum by the addition of water, and in those interlaminated beds of alternating gypsum and anhydrite, one has to penetrate to a considerable depth to find unaltered anhydrite. Many thick beds of apparent solid gypsum contain included stringers of anhydrite, indicating the original mineral was anhydrite.

Gypsum is economically valuable as the source of Plaster of Paris. The water content is driven off by heat resulting in a fine white powdery substance. By the re-addition of water the powdery material is bonded together into the solid material we are all familiar with. The mineral anhydrite, its anhydrous counterpart, is commercially valueless.

Beds of sodium chloride, forming the common salt mineral halite, of exceedingly great depth are not uncommon. Salt beds are present in various geological formations of different ages, but are most commonly found within the strata of the Silurian, Permian and Triassic periods of Paleozoic and Mesozoic eras respectively. Within continental United States the oldest halite beds occur in the

Silurian period of Mid-Paleozoic era in New York State, where they parallel the southern shore of Lake Ontario.

The New York State salt beds consist of alternating strata of halite, gypsum, and anhydrite, interbedded with layers of shale, limestones and stringers of clay deposits. Some of the individual halite beds within this formation total 470 feet in total thickness. The beds are of variable thickness, however, and formation depths represent average figures only. In comparison with some of the other world localities, the New York deposits are relatively meager. A single salt dome which caps one of the sulphur deposits in the Texas-Louisiana field is reputed to have been drilled through 5,410 feet of pure halite. An extensive salt mine of pure sodium chloride in Galicia is quite a tourist attraction. The bed is some 1000 feet in thickness and consists of snow-white halite, which has been mined out through the years, leaving domed rooms and vaulted archways of great beauty.

The potassium-magnesium salts Sylvite, Carnallite and their associated minerals Kainite and Kieserite are especially valuable for their potassium content in the manufacture of fertilizers. These salt minerals being the last to separate from the solute body, any deposition of them would naturally overlay the earlier precipitated salts, halite, gypsum and anhydrite. Extensive deposits of these minerals have recently been discovered near Carlsbad, New Mexico. The Prussian deposits have been known for many years. Their presence indicates very long periods of static conditions to warrant their deposition in such quantities. As would be expected, all of these salts are readily soluble in water. Some of them may hydrate from exposure to normal atmospheric changes.

The Borate salt minerals are chiefly a product of evaporation from very shallow basins covered by thin sheets of supersaturated waters rich in boron. Boracite, one of the economically valuable borate minerals, does occur however, as nodular masses inter-crystallized with the potassium salt carnallite, as one of the end separation products from evaporating marine waters. Some of the borate minerals are not a product of direct evaporation from a solute body, but represent a replacement, either partial or complete, after some other mineral which did crystallize by evaporation from a solution. Thus, Kernite probably replaces original Borax through chemical reaction with ascending hot waters, presumably of volcanic origin. Tincalconite is an alteration product of Kernite, Colemanite and Kramerite are replacement minerals after Ulexite which has been leached with sodium chloride solutions.

We have remarked about the different minerals produced from evaporation of a solution carrying a double-salt as opposed to those precipitated from a single salt solution. For example, the mineral Mirabilite will crystallize from a chemically pure concentration of sodium sulfate, and yet that same solution intermingled with sodium chloride will produce the mineral Thenardite. Likewise, aragonite, the less stable form of calcium carbonate, is formed when a lime solution is impregnated with a sulfate.

The beautiful cave deposits displaying many spectacular calcite, stalactites which hang from the cave ceilings, as well as the drapery effects of great sheets of calcite hanging in festooned beauty from both the ceiling and side-walls of the caves, are formed as the product of evaporation of percolating waters rich in dissolved lime as those waters drip within the cavern. The varying color combinations of cave formations are the result of included chemical impurities in the solution, such as iron, copper and others.

This very brief introduction to the most fascinating story of the minerals in our world is intended to stimulate more individual enthusiasm for the complete story as revealed to us in more comprehensive surveys of this material within various text books on the subject. By no means is it intended as a short-cut replacement of that more detailed information. If this article serves that purpose the writer will feel amply rewarded.

COAL MINING TO BE BOOSTED IN THE FAROES

Washington, March 2—A Marshall-Plan approved project to boost coal output currently is underway in the Danish-owned Faroe Islands.

The Economic Cooperation Administration said today that Henning J. K. Marstrander, American coal mining engineer of the U. S. Bureau of Mines in Birmingham, Ala., has arrived on the islands for a three-months' study of mining operations.

Under ECA's technical assistance program, Marstrander will conduct a survey to determine the feasibility of increasing production from a current 12,00 tons to 48,000 tons annually. He will also make recommendations to the Danish Government of methods to improve the efficiency of the mining operations.

Mining methods in the islands are now primitive and do not result in full production. The Danish Government plans to increase production to provide enough coal for internal needs and to develop a surplus for export to Iceland and Denmark if coal can be produced on a competitive basis.

The Faroe Islands, which lie midway between Great Britain and Iceland, have an area of 540 square miles and a population of 26,000.

Marstrander, a former engineer with the Faroe coal mines, attended the Norwegian School of Mines and was a mine consultant in Oslo, Norway. Prior to this employment with the U. S. Bureau of Mines in 1943, he was chief of the coal mines department for the Iranian Government in Tehran and had five years experience in mechanized coal mines in Western Pennsylvania.

Dollar costs of the project, estimated at $2,500, will be paid by ECA.

Dealers Are Swell People!

Editor R & M:

Your *Rocks and Minerals* is a wonderful help to me, attempting to study mineralogy. I didn't know quartz from hornblende when I started and the fine dealers who advertise in it are all "swell people."

Bennett Luedtke
Wausau, Wisc.

February 23, 1950

Planning A Vacation!

Editor R & M:

I am now planning my next summer vacation in the West and find the old copies of *Rocks and Minerals* very valuable in selecting the places I am going to prospect during my vacation.

Walter F. Eisele
Arcanum, Ohio

April 3, 1950

Anxiously Awaiting Next Issue!

Editor R & M:

Words cannot describe the enjoyment I've received from your publication. It is a most excellent means of keeping up with what's new in rocks and minerals. Anxiously awaiting the next issue!

J. Anthony Denson
Washington, D. C.

March 8, 1950

Gritzner Moves to Mesa, Ariz.

Editor R & M:

Boy oh Boy did those Help! Help! Help! ads in R & M get me the contacts!

We decided finally on buying a home in Mesa and from there do our mail order business. So please change our address from Yuma, Ariz., to Mesa, Ariz.

Charles F. Gritzner
Mesa, Ariz.

April 6, 1950

Envies Warm Climate Collectors!

Editor R & M:

I've been devoting most of my time to a schedule for some profitable rock hunting this summer. I've been out the last two Sundays (I froze); I guess I will have to wait for warmer weather. I envy the people who live in a climate which permits all the year round rock hunting weather.

Here's a money order for $3.00 as renewal dues. I hope to have more success with my membership card this year—in the last two years I lost both of them about a month after I received them.

Gotta sign off now, as the geologist said to the fossil "Dig you later!"

Paul N. Caravetta
Chicago, Ill.

March 22, 1950

THE CHIPMAN LEAD-SILVER MINE IN NEWBURY, MASS.

By PROF. CHARLES PALACHE

Cambridge, Mass.

The pioneer settlers of New England were keenly alive to the possibility of finding metallic riches in their new lands. In Connecticut and later in Vermont a number of productive mines were worked; but in Massachusetts, while many promising samples of ore minerals were found, no mines were found in early days except for those of iron and the very doubtful graphite mine at Sturbridge (1). Two metal mines were however ultimately operated in the Bay-State —the Newbury Silver Mine which had a brief but exciting life; and the Davis Pyrite Mine with a longer life but a less spectacular career except for its abrupt finish. The history of the Newbury mine has been recorded in some detail and in the following pages will be brought together from various scattered sources, the story of its rise and fall.

The beginning of the Chipman mine was recorded by Robert H. Richards, (2) who for many years presided over the Mining Department of the Massachusetts Institute of Technology. He states that in August 1874 he was shown a specimen of galena, said to have been found near Newburyport. In the weathered specimen he identified galena, tetrahedrite and pyrite. A few days later he accompanied Dr. E. J. Kelley to the locality about two miles southwest of Newburyport in Newbury. He there saw in a barn about four tons of galena ore in which he found a rich specimen of tetrahedrite. This material had been taken from a pit the preceding Spring, dug to a depth of six feet.

Under Richards directions the pit was dug deeper and it was established that the galena was contained in undisturbed glacial drift. Fragments were found pointing to a source towards the northeast and pits were sunk and subsequently revealed the vein of ore in place in the gneiss. By November the vein had been established over a length of some one hundred and fifty feet. Assays showed a high content of silver and some gold, the tetrahedrite being far richer in both than the galena. Two shafts were started in the Fall of 1874 and in both the vein was found with a width up to six feet. A solid mass of galena three and a half feet wide was seen in one shaft. This was the beginning of the Chipman Mine and Richards' guarded and factual account ends here. But his findings started a veritable mining stampede in the quiet Newbury countryside. The story has been told by another man of science, H. E. Hovey (3). The discovery of a small pocket of silver-bearing galena during road building in 1901 in Newbury was the reason for his reminiscent article.

According to Hovey it was in 1868 that Edward Rogers found float ore in the Highland pasture in Byfield. He and Albert F. Adams traced these fragments to land belonging to Mrs. Richard Jacques from whom they bought eight acres for $350. After six tons of galena had been extracted the property was bonded to Chipman and Kelley in August, 1874, for the sum of $100,000, and these parties at once began active operations. Chipman afterwards sold out to the Hon. E. P. Shaw. A second mine was opened on the adjoining lot, belonging to the Hon. Moody Boynton. The Chipman and Boynton mines were united by tunnels, and shafts were sunk to the depth of 170 feet. Consolidation took place and a stock company was formed under the name of the Merrimac Mining Co. Three-quarters of a mile nearer Newburyport the Lawrence Company opened a third mine; and not far from it, on land owned by Robert Smith, The Bartlett Company opened a fourth mine. These four mines were along the strike of the country rock which is about North, 75° E. The dip of the veins was vertical for thirty or forty feet, then inclined to the southeast while the dip of the gneiss was in the opposite direction. Besides galena,

pyrites and quartz, the lodes yielded siderite, limonite, hematite, tetrahedrite, malachite and azurite. The concentrate yielded from $150. to $250. worth of metals to the ton.

The excitement became intense and speculation was rife. Prospecting went on in all parts of Newbury, Newburyport, Boxford, Salisbury, Georgetown and other parts of Essex County. Barren hills and arid pastures were in the market at fabulous prices. The climax was reached on that gala day, June 2nd 1875, when Newburyport was decked out as for a Fourth of July celebration; a cavalcade with a brass band headed a long procession that escorted a train of wagons loaded with 160 tons of the argentiferous ore which was finally taken on board the schooner *Nadah* for transport to New York.

The mining continued for about six years with waning results as the costs increased and values diminished. By 1880 operations were practically abandoned although it is possible they might have been continued with more modern methods of working.

So far the story according to Dr. Hovey. It is taken up again in an article by Frederick E. Greene (4) in 1923 which brings it down to recent times. Greene tells the story of the discovery in much the same way as Hovey but adds one picturesque feature. In 1875 Mrs. Jacques hired lawyers and secured an injunction against the Chipman Mine and Adams on the ground that fraud had been committed in the purchase; that Adams knew the land contained ore before he bought it for pasture land. The claim is stated to have been settled for $25.000 and costs—quite a contrast to the $350 originally paid.

The vein revealed in the Chipman Mine, its size and apparent richness brought all kinds of mining adventurers into the little farming town of Newbury. The original find was sold and resold, combined with a neighboring property, organized and reorganized. Hundreds of holes were blasted out in Newbury from 1874 to 1880 over territory five miles square. Custom smelters were built on the wharves of Newburyport and others out in the wild part of Newbury where the mines were located. The Merrimac Co. had its own smelter and mill and was the only company to pay dividends. It paid nearly $100,000 in one of the years it was operated, but would not have done so if notice had been taken of worn-out machinery or of development work necessary to find new ore bodies. The mine was sold and a new company fully equipped it with new machinery but discovered too late that its officials had bought a salted mine and had no ore to treat. So the mine was closed down in 1880. It was not reopened until 1919. In that year new buildings were erected and new equipment installed for which the public subscribed to the tune of $140,000 to keep the mine open during three years. Unfortunately the way the money was spent did not show whether any ore could be developed in the mine or not for no real development work was undertaken excepting in curb broker's offices. With the mine officers under arrest and the mine in bankruptcy, everything was sold at auction under order of the court on October 2nd, 1922 for the small sum of $1,500. So the Chipman Mine died twice—once for lack of ore, a second time for lack of dupes in the Boston broker's offices to buy stock.

The writer had a personal experience in the Merrimac or Chipman Mine during its last brief period of life which may be worth recording if only as a warning. At the time I came to Cambridge, 1895, the shaft house of the old mine had been burned and all that was to be seen there was a hole in the ground, a small dump and some rotting sacks of ore. One of my students, Robert Hoffman, told me in 1920 that the old mine had been reopened and that he was making a study of it and a map of its workings. Through him the superintendent of the mine invited Professor Raymer, then Professor of Mining at Harvard and me to bring our students for a visit to the mine. We made quite a party and went down on a Sunday when the mine was not working.

We found a model mining outfit; new shaft house and hoist in the old vertical Chipman shaft; bunk houses and a boarding house; a small crew of men who looked like western miners and who were as a matter of fact just that. We had to sit down to a hot meal at noon and were then taken underground. I have a blue print of Hoffman's mine map before me as I write. The main shaft was 220 feet deep, a second shaft was 100 feet and there were several hundred feet of reopened levels; stopes had been opened out and in one place there was visible a three-foot vein of the typical massive galena ore. It looked like a going concern, small to be sure but likely enough to produce some ore, at least to our casual inspection.

We returned to Cambridge with heavy bags of specimens and well pleased with the day. On examining the collection in the laboratory, besides massive galena, pyrite and siderite which were the chief ores, I found in one specimen picked up at the shaft head a narrow vein of carbonates with a cavity in which was a tiny crystal of unmistakeable ruby silver together with a thread of argentite. These were surprising and new for the locality and for New England. I was writing to the superintendent anyway to thank him for his entertainment and added a paragraph to the effect that he would be pleased to know I had found some "high grade" in my specimens, telling him about the veinlet.

My letter was typed and ready to mail when Professor Raymer came in to my office with a newspaper in his hand. "Have you seen this, Palache?", he said and showed a quarter-page advertisement of the Merrimac Development Co., with a blurb about its good prospects, some wild assay values and quotation from old geological reports about the area. Stock was to be had at the Boston office. Of course this opened my eyes to the real nature of the mining project—a stock-selling fraud. I saw my letter the center of a new ad with my "high grade" in letters inches high. How glad I was my letter was still on my desk and could be torn up and thrown in the waste basket. I had no way of knowing whether the rich specimen had actually come from the mine or was "a grain of salt" to fool some unwary visitor such as I had proved to be. At any rate I have never recorded the two silver minerals as native to New England. I have never seen the site of the mine since that day in 1920 and do not really know what is now to be seen there. Probably a waste dump with an abundance of siderite vein matter burned bright red by the oxidizing effect of the sun.

Anyone who desires to learn the nature of the geological environment of the Chipman mine will do well to read the paper by Clapp and Ball (5) written in 1909. In their description of the mine they In their description of the mine they estimate that the total production in the six years of active life was about fifteen hundred tons of concentrates with an average value of one hundred dollars a ton.

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H. Brown
Pacific Museum
Shell Beach, Calif.

April 12, 1950

GEOLOGY OF THE BROOKLYN-BATTERY TUNNEL

By THOMAS W. FLUHR

The Brooklyn-Battery vehicular tunnel is rapidly approaching completion. Its construction adds somewhat to the accumulated mass of geologic data in the New York City area, and the problems encountered are of interest to both engineers and geologists.

The tunnel is part of a series of arterial highways which, when completed, will link the various parts of New York City together and with the surrounding region, permitting that rapid vehicular inter-communication which is essential to the continued growth of the city.

History of the Project

A vehicular tunnel linking lower Manhattan with the borough of Brooklyn was first officially proposed by the Department of Plant and Structures of the City of New York in 1929. In 1936 the New York City Tunnel Authority was authorized to construct and operate the tunnel. Studies and exploratory borings were made. The Reconstruction Finance Corporation made funds available for construction, which was begun in October 1940. The work, suspended during the war, was resumed after its close. The New York City Tunnel Authority, which designed and began construction of the tunnel, has been consolidated with the Triborough Bridge Authority to form the Triborough Bridge and Tunnel Authority, which is completing the work.

Location of the Tunnel

The tunnel, which consists of twin tubes, beginning at a plaza just north of Battery Park in the borough of Manhattan, extends beneath Upper New York Bay and Buttermilk Channel to Hamilton Avenue in the borough of Brooklyn, terminating in a plaza which extends from Richards to Hicks Street. The course of the tunnel nearly touches the northeasterly shore of Governors Island. The twin tubes are 31 feet in diameter and some 9100 feet in length. Ventilation shafts are located at the Manhattan and Brooklyn ends and also near the midpoint at Governors Island.

Geologic Features of the Tunnel

Bedrock does not outcrop near the tunnel and the kind and quality of the soil overburden were unknown except in a very general way. Extensive subsurface explorations were therefore undertaken to determine the geologic features affecting design and construction.

Old maps and boring and well records were studied and all available subsurface data in the area collected. In 1937 the Tunnel Authority made preliminary test-borings along a tentative route. The explorations revealed that the bedrock lies close to the surface for a long distance along the line of the tunnel, extending from Battery Park beneath Upper New York Bay to Governors Island and beyond, to a point beneath Buttermilk Channel, beyond which the rock floor drops off rapidly in elevation.

In the early part of 1939, test-borings were made in connection with a proposed bridge along much the same course. In the latter part of 1939 a second set of test-borings was made by the Tunnel Authority, and in 1941 the sites of the plazas were investigated.

A ridge of Manhattan schist forms the backbone of Manhattan Island. It reaches its highest elevation near Spuyten Duyvil at the northerly extremity of the island, and slopes downward to the southwest, until at Battery Park it reaches a level varying from 15 to 40 feet below sea level. The ridge continues beneath the waters of the Upper Bay to Governors Island. It reappears on Staten Island, where it has been intruded by an igneous rock, now altered to serpentine. The tunnel follows the course of this ridge from the Battery to Governors Island and then bends toward Brooklyn, leaving the rock ridge and crossing beneath Buttermilk Channel through the overburden.

In Brooklyn, the bedrock formation is the Brooklyn injection gneiss, a mixed rock formed from the Fordham gneiss by intrusion of the Ravenswood granodiorite. It lies at depths of more than 100 feet below the surface.

Between the ridge of Manhattan schist and the injection gneiss of Brooklyn there

is a deep gorge in the bedrock It is inferred that this gorge, which lies beneath Buttermilk Channel, has been formed by erosion along a belt of the Inwood limestone, the rock formation normally found between the gneiss and schist.

It is interesting to note that further to the northeast there are two belts of limestone; one the Inwood, and a second known as the Hell Gate dolomite. No evidence of the presence of the latter was disclosed by the tunnel borings.

The geologic age and correlation of these bedrock formations is a matter of controversy. No actual proof has as yet been found, but the author is inclined to the belief that they are all of Paleozoic age.

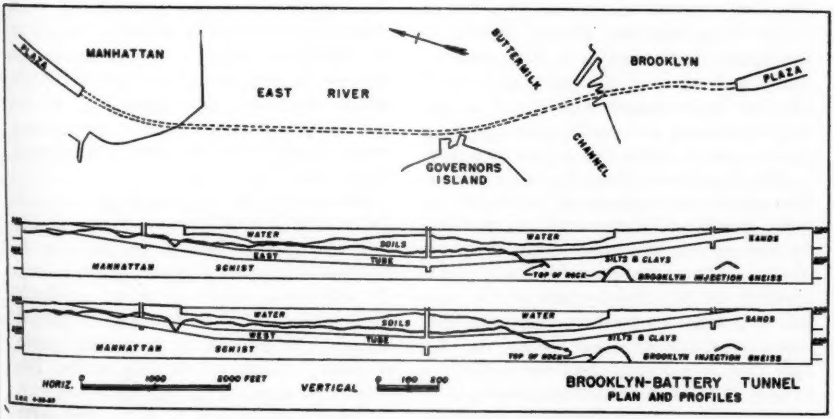
Since the bedrock floor in Brooklyn lies far below the surface, the design of the Brooklyn plaza and adjoining tunnel sections was governed by the kind, distribution, and physical characteristics of the soil overburden. With this in view, most of the borings in Brooklyn were made particularly to investigate the overburden, but several borings at the site of the Brooklyn ventilation shaft were carried into bedrock. Above the bedrock lie undisturbed glacial deposits, which are overlain by sandy stream deposits. These in turn are covered with peat and river silts on top of which artificial fill has been placed. The soil strata naturally vary greatly in distribution, thickness, and behavior. Some are firm and well-suited for foundation purposes, while others are loose, unstable, and capable of consolidation.

Relations of Geology to Design and Construction

During the planning and construction it was essential to keep the geologic features of the area constantly in view, for the position of the bedrock floor, the kind, quality, and structure of the bedrock, the kind, position, and quality of the soil overburden, and the behavior of the ground water intimately affected both the design and construction of these tunnels.

The first step was to determine the course of the tunnels for line and grade, having due regard to function and safety and economy of construction.

A rock tunnel driven in free air is more economical than a shield-driven tunnel with compressed air. Therefore when the preliminary borings showed that the rock floor lies quite near the surface for a long distance along the course of the tunnel, studies were made to determine the practicability of placing it so that as much of its length as possible would be within the bedrock. The second and more detailed program of borings furnished the necessary data. It was determined that the elevation of the bedrock floor is suffi-



Plan and profiles of the Brooklyn-Battery Tunnel.

ciently high to permit driving in rock and in free air throughout most of the distance from Battery Park in Manhattan to Governors Island and beyond to a point beneath Buttermilk Channel.

Driving rock tunnels of large diameter for such a long distance beneath an arm of the sea, and with only a shallow cover of rock, is a hazardous procedure, for despite the numerous test-borings there was still a risk that undiscovered depressions in the rock floor might reach below the tunnel roof. In fact one such depression near the Manhattan bulkhead had been found and explored by the borings. Moreover faults and open joints, undisclosed by the borings, might afford easy access for water into the tunnels.

In view of this the tunnels were placed as deep as possible so as to obtain the safety of an adequate rock cover. The limiting factors as to the depth were the necessity of avoiding steep grades which would slow vehicular traffic and the possibility of encountering depressions in the rock floor of such extent that construction would have to be carried on with the aid of compressed air.

With the exception of the gorge or depression in the rock floor near the Manhattan bulkhead the rock in general is of fairly good quality although to some extent broken by faults and joints. The foliation dips steeply. An unfavorable although unavoidable feature of the construction was that the tunnels had to be driven in a direction almost parallel to the strike of the foliation, thus insuring that any broken or decayed zone would have to be reckoned with for a longer distance than if the construction was more nearly at right angles to the rock structure.

The tunnels in Brooklyn were driven through the overburden by means of the usual shield and compressed air method. Because of the unusually large diameter of the tubes, the pressure differential between the top and bottom of the tunnels was some 14 pounds. Near the construction shafts the soil cover was so thin that a working pressure sufficient to keep out the ground water would tend to cause blowouts at the roof. To minimize the danger the ground water level was lowered by pumping, thus reducing the air pressure required.

The Manhattan construction shaft and Manhattan plaza presented no serious difficulties, for the rock floor is high, and most of the overburden is fairly impervious thus obviating any trouble from ground water. Since the centerline of the Manhattan plaza follows the strike of the rock foliation, which dips steeply, and since the upper part of the bedrock is weathered, considerable overbreakage occurred in some places.

In Brooklyn, two construction shafts were excavated in order to erect the shields, by the aid of which the tunnels were driven from Brooklyn toward Governors Island. It was proposed to lower the water table by pumping in order to sink the two construction shafts without having resort to the use of pneumatic caissons. Most of the overburden consists of pervious sands, with the water table lying practically at sea level. It was necessary to estimate the approximate amount of pumping required in order to lower the ground water below the level of the bottom of the proposed shafts. Although several of the test-borings had been fitted with strainers to permit observations of the level of the ground water, time did not permit resort to pumping tests in order to determine the capacity of the ground to supply water. More accurate methods of determination being lacking, dry samples from the test-borings were inspected, assumptions made in regard to the character and effective grain size of the sands, and rough calculations made which indicated that pumping at the rate of two thousand gallons per minute would be sufficient to unwater the ground to the desired depth.

The nature of the overburden was of the utmost importance in designing the Brooklyn plaza. Most of the plaza is depressed below the original ground level, the approach roadway rising gradually from tunnel level to the present ground surface. The sides of the plaza are formed of heavy masonry retaining walls. The superficial deposits in the plaza area, such as the stream-deposited sands, peat, river silts, and artificial fill were not deemed

capable of supporting the retaining walls. Therefore it was proposed to found them on piles which would transfer the load to the substantial undisturbed glacial deposits beneath.

Construction of the Tunnel

While the shafts were being sunk and the tunnels driven a careful record of subsurface conditions was made.

The Manhattan Construction Shaft

This shaft was excavated to the bedrock, 33 feet beneath the surface, using sheet steel piling to support the sides of the excavation. In spite of the pervious nature of the artificial fill and the rather unstable river silt below it, no difficulty was experienced and only small quantities of ground water came in. Excavation was then continued by drilling and blasting through the bedrock, which was of good quality.

The Governors Island Shaft

At this place the bedrock lies deep beneath the surface and the soil is saturated, since the site is in the Bay, just off the island. A small artificial island was constructed by filling and the shaft constructed by sinking a large pneumatic caisson to bedrock, which was then penetrated to tunnel level by the usual rock methods. The caisson will later form a base for the ventilation buildings.

The Brooklyn Construction Shafts

From these shafts the cast-iron lined tunnels penetrating the unconsolidated sands and clays of Brooklyn were driven. Most of the overburden consists of pervious water-bearing sands. In order to sink the shafts without recourse to the use of pneumatic caissons, the ground was unwatered, thus permitting open excavation. In order to do this, three deep wells were drilled close to the shafts, one having a capacity of 1000 gallons per minute and the other two, 500 gallons per minute each. As excavation progressed, well-points were used to supplement the deep wells. The aggregate pumpage required to unwater the ground was 1900 gallons per minute, in close accordance with the preliminary estimate.

The Brooklyn Tunnels

Twin tunnels were driven northward from the Brooklyn construction shafts to their junction with the twin tunnels driven from Manhattan. They are cast-iron lined and were shield-driven with the aid of compressed air.

In order to minimize the possibility of blowouts in the sections adjacent to the shafts, where the soil cover is thin, the ground water table was lowered by means of a Ranney water-collecting system. This consisted of a concrete caisson 13 feet 4 inches in outside diameter and 70 feet deep, sunk by open dredging. When it had reached the desired depth the bottom was sealed by the tremie method. Radial horizontal pipes equipped with the strainers were jacked out from the lower part of the caisson. The pipes discharged into the well, in which two 2200 gallon-per-minute pumps were installed as well as one 750 gallon-per-minute pump. The withdrawal of some 2500 gallons per minute, in conjunction with the pumping from the deep wells at the construction shafts, lowered the ground water throughout a wide area. effectually reducing the air pressure required.

Adjacent to the shafts the upper part of the tunnels found pervious water-logged sands and gravels overlying river silts. These afforded some water but as soon as the hoods of the shields passed below the river silt the inflows ceased. The shields, passing through the overlying fluviatile sands, entered undisturbed glacial deposits as the tunnels advanced.

The Tunnels from Manhattan

Twin tunnels were driven southward from the Battery Park construction shaft toward Governors Island. Since only a thin cover of rock and soil separates them from the waters of New York Bay it was essential to excavate them with the utmost care. For this reason they were not excavated to the full size at first, but pilot tunnels or bottom drifts approximately twenty feet in diameter were driven. This procedure leaves a thicker cover of bedrock over the pilot tunnels, lessening the risk of inflows from above. Test holes pointing upward and outward were drilled frequently in order to insure that sufficient rock cover was present and to determine the quality of the rock. Occasionally

water-bearing joints were tapped, some of which were grouted. Later the pilot tunnels were enlarged to the full 31 foot size, with the aid of shields and the tubes lined with cast iron.

The bedrock is the Manhattan schist formation, a micaceous, well-foliated rock. Although the direction of banding or foliation of this rock varies, in general it crosses the tunnel axis at an angle of 15 to 20 degrees and dips almost vertically. Most of it was of good quality and required no support. As usual with this kind of rock, a little air-slacking took place making some scaling necessary. In spite of being driven beneath a body of water these tunnels were much drier than expected and inflows of water were infrequent. There were two reasons for this, one being that the products of decay of the schist fill up the joints, and the other that the overburden which occupies the bed of New York Bay is relatively impervious and prevents rapid downward transmission of water.

One problem was a gorge or depression in the rock floor, which crosses both tunnels near the Manhattan bulkhead and brings the top of the bedrock down within the tunnel limits. It had been discovered and explored carefully by means of test-borings and provision made for penetrating the soft ground. When the pilot tunnels approached the gorge, the bedrock was found to be jointed and wet, and the direction of strike of the rock foliation changed, indicating approach to a fault. The rock was explored carefully by means of test holes driven upward and ahead of the excavation, and by this means the gorge was located more precisely than had been possible by means of the preliminary test-borings made from the ground surface. Bulkheads and airlocks were installed to permit the use of compressed air. When this was applied a considerable amount of air escaped through joints in the rock, and to minimize it a thin layer of gunite was applied to the rock. Wall-plate drifts were driven through the soil filling the gorge and liner plates used to support the roof until the hard rock south of the gorge was reached. This section of the pilot tunnels was then lined with concrete. As predicted, the gorge, which reached down nearly to the inverts of the tunnels, had been formed by erosion along a belt of rock previously weakened by faulting. It was partly filled with a pervious mixture of sand, gravel, and boulders, but fortunately an impervious layer of compressed peat at the roof prevented any large inflow of water. The pilot tunnels found the gorge to be narrower than had been expected.

Although subaqueous tunnels always entail hazards, in this case thorough exploration of underground conditions both before and during construction has greatly minimized the risks and cost.

JUDGES APPOINTED FOR INSIGNIA CONTEST

The following Judges have accepted appointment to judge the insignia contest being sponsored by the American Federation of Mineralogical Societies.

Mrs. Verah W. Landon, Seattle, Washington, Northwest Federation of Mineralogical Societies.

Mrs. Dorothy Craig, Los Angeles, California, California Federation of Mineralogical Societies, Inc.

Mr. Chester R. Howard, Denver, Colorado, Rocky Mountain Federation of Mineral Societies.

The Mid-West Federation of Geological Societies, the other affiliated regional federation, has waived its right to be represented by a judge, inasmuch as it is host to the national convention in Milwaukee in June, at which the winners will be announced.

Richard M. Pearl
Contest Manager

A ROCKHOUND'S PARADISE

By DON MacLACHLAN

N.O.T.S. Rockhounds

China Lake, Calif.

If you could make a sizable collection of fine minerals right in your own "back yard" would you be interested? Few clubs are blessed with such a wealth of collecting localities as the N.O.T.S. Rockhounds (N.O.T.S. stands for Naval Ordnance Test Station) and their neighbors the Searles Lake Gem and Mineral Society and the Mojave Mineralogical Society. Our "back yard" is the northern fringe of the Mojave desert in south central California. It would be hard to find an area richer in variety of specimens available.

Within a round trip distance easily covered by car in one day we have such localities as Searles Lake. From this great dry lake bed come a long list of minerals, many of them found in no other locality in the United States: halite, hanksite, burkeite, gay-lussite, pirssonite, tincal, trona, sulphohalite and others. The American Potash and Chemical Company have been working this dry lake for many years and obtain a variety of products such as borax, potash, soda ash, lithium and various other chemicals. They are continually coring the bed of this vast mineral deposit to obtain samples and to chart the stratigraphy of the beds which extend to great depth. After their research department has obtained its information many of the cores are placed on a dump where they are available to collectors for specimens. This courtesy has made many rare minerals, which normally occur only at great depth in the lake, available to collectors.

Various borate minerals are also available on the old dumps at Boron, Calif., where the Pacific Coast Borax Company operates mines. Here ulexite, borax and colemanite can be found. Some of the ulexite, though soft, makes beautiful cabinet gem specimens when polished. Borate and silver minerals are also found around the ghost towns of Borate and Calico in the Calico Mountains.

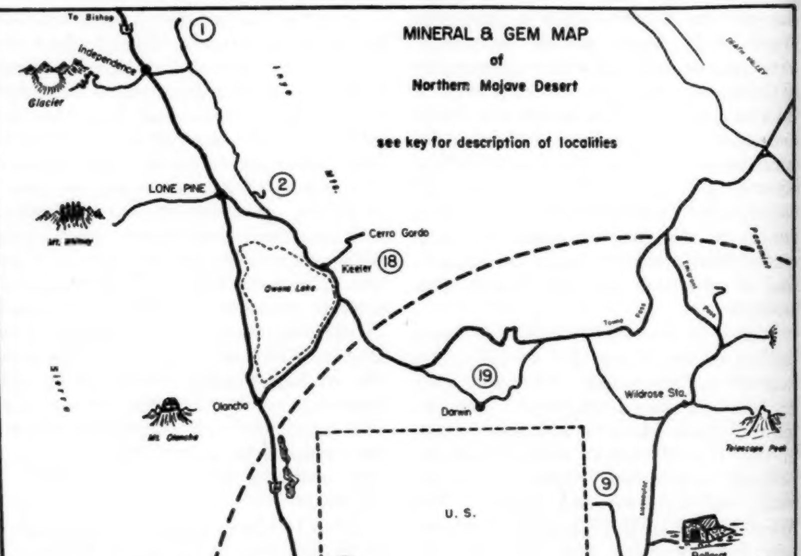
It is hard to list the varieties that can be found at Darwin, Calif., where the sedimentary rocks that make up the area have been subjected to intense metamorphism and hydro-thermal action has deposited a wide variety of lead, zinc, silver and copper minerals. In a one hundred foot section of just one dump specimens of galena, pyrite, linarite, calcite, fluorite, and goethite pseudomorph after pyrite were collected in half and hour. Sphalerite, caledonite, scheelite, plumbojarosite, sulphur, cerussite, anglesite, brochantite, chrysocolla, azurite and malachite have all been collected in this area. This is an old mining district, having been continuously active since the 1870's. The hills are dotted with dumps that haven't been touched by serious collectors. Many days could be spent in this locality to advantage.

Cerro Gordo is just a few miles north of Darwin but it is also a few miles higher; almost two to be exact. The mines are at an altitude of over 9000 feet in the Inyo Mountains. The road climbs from Keeler at 3,600 feet altitude straight up the mountain to reach the mines that are only seven and one half miles away. That is climbing one mile in about seven. The road is 52%, yes that is right, in some places. A good car in good condition can make the grade which is not dangerous, only steep. The list of minerals from Cerro Gordo is about the same as Darwin, though they occur in different forms. It is a rugged trip but the thousands of tons of dumps have been virtually unscratched because of their isolation. For the strong of heart it is a wonderful challenge.

Less than fifteen miles from Keeler to the north is amazonite and beryl in crystals, some as large as an inch and a half across. Fifteen miles further north is a mountain of smoky quartz available

in individual crystals and plates. This is east of Independence, Calif.

A favorite field trip sixty miles to the west takes in several localities in the Greenhorn Mountains. Though it can be made in one day, this is usually an overnight trip with the groups camping in the beautiful, improved Kern County Camp right on the summit of the mountains. There are several mines and localities to visit within a few miles of the camp. Three mines just below the sum-



Mineral and Gem Map of Northern Mojave Desert, Calif.

(For description of localities, see key on opposite page.)

mit yield particularly fine crystals of clear scheelite, one of the few localities where this form is found. Epidote, and epidote pseudomorph after garnet are also collected from these mines. Tourmaline in quartz, odd forms of orthoclase, odd and complex quartz crystals, rose and smoky quartz all contribute to make this a favorite collecting area.

The famous Rand gold, silver and tungsten district is only a few minutes from home. A few miles beyond Randsburg is the famous "spud patch" at Atolia where a commercial operation is working the placer deposit of scheelite "spuds," a potato-like nodule of this tungsten mineral. Last Chance Canyon in the El Paso Mountains is less than an hour away and holds a wide variety of minerals including chalcedony casts of calcite, precious opal, various forms of petrified wood and cryptocrystaline quartz. There is a locality at Cinco where an hour's work will yield a hand full of Carlsbad twins of feldspar. Just over the hill is aragonite in beautiful blue green radiating crystals. Hydrozincite, smithsonite, howlite, gypsum, strontianite, celestite and others; it almost seems sometimes that the whole of Dana is represented by some locality within a relatively few miles of home.

All of the localities named and many other minor deposits are planned as field trips for the 1950 Convention of the California Federation of Mineralogical Societies which is to be held at Valley Wells near Trona, California, June 17th and 18th. Our three clubs, which are co-hosts to the convention, are organizing the trips. Guides will be available to lead visitors to all of the good deposits of the area. There will be at least one guide for each locality and even though only one person wants to make the trip we will see he has the opportunity.

The meeting is to be a real convention of rockhounds with camping out, camp fires, barbeque, outdoor exhibits and field trips galore for both mineral collectors and gem polishers. No matter what your interest, if you are a rockhound, there will be something to interest you at this "rockhound paradise."

Key to Mineral and Gem Map of Northern Mojave Desert

1. Smoky quartz crystals and plates.

2. Amazonite and beryl (aquamarine).

3. Obsidian, cristobalite and fayalite.

4. Quartz (desert diamonds) and sanidine.

5. Jasper.

6. Jasper and agate.

7. Jasper, agate, chalcedony, petrified wood (palm and fig), precious opal, opal, chalcedony casts of calcite, calcite.

8. Cinco: five miles off map on Highway 6—Carlsbad twins of feldspar and aragonite.

9. Travertine (Death Valley onyx).

10. Ophicalcite.

11. Halite, hanksite, burkeite, gay-lussite, pirssonite, tincal trona, sulphohalite.

12. Agate, chalcedony, jasper, precious opal, opal, nodules, geodes.

13. Rand District: Gold, silver and tungsten minerals and ores. Scheelite "spuds."

14. Smoky and rose quartz, odd forms of quartz crystals, tourmaline in quartz, gem clear scheelite crystals, epidote and epidote pseudomorph after garnet.

15. Kramer Hills: 35 miles off map on Highway 395. Jasper, petrified wood and agate.

16. Calico Mountains: (Ghost towns of Calico and Borate) 60 miles off map on Highway 466. Petrified palm root and wood, travertine, colemanite, howlite (not cutting material), gypsum, strontianite, and celestite.

17. Boron: 30 miles off map on Highway 466. Colemanite, ulexite and other borate minerals.

18. Galena, argentite, chrysocolla, malachite, azurite, quartz and other lead, zinc, silver, copper and gold minerals.

19. Galena, pyrite, sphalerite, linarite, calcite, caledonite, scheelite, plumbojarosite, sulphur, fluorite, cerussite, anglesite, brochantite, and possibly some of the rarer lead, zinc and copper minerals.

FOOT-ITCH

By F. R. KLINK

1440 Bryan Ave., S. W., Canton 6, Ohio

Did you ever have the urge to just go and go and keep on going—well that is what it is like to have the foot-itch. So being in sound health and questionable sound mind. (all rock hounds are supposed to be nuts) we headed the trusty Kaiser into the great outdoors and after several days we came to a halt in front of the home of John Tobola, at Calumet, Mich., with whom we had a date to go fishing and rock hunting for a whole week. This being Sunday we spent the day just getting acquainted and planning what we would do and where we would go. Well fish won out for the first day. It was the 4th of July and a beautiful day. We chartered a cruiser and headed out into Lake Superior after the famous Lake Trout off Keweenaw Point. We not only connected with seven nice trout, but also some fog and after that cleared we struck some rough weather, I did not mind it sitting in the trolling chair, but when I got up to get a lunch I found I didn't have sea legs. What a sensation! I landed against the side of the Cabin and broke my glasses and then on the rebound I grabbed for anything within reach and it happened to be the exhaust pipe—it was hot and I let go in a hurry and grabbed the back of a trolling chair and stayed put. But all said and done it was an enjoyable day and yours truly had one beautiful sunburned nose, it felt like a piece of leather. After ten and one-half hours on the lake we were back where we had to learn to walk again.

The next day it rained and turned cold. We put on our rain coats and poked over the local mine dumps looking for Datolite. We found several very good specimens of Conglomerate and Native Copper, but no Datolite. I also found a piece of glass which had taken on a beautiful purple color and after admiring it I was going to throw it away when Tobola stopped me. He said it was something that was much sought after by collectors so my wife put it in her bag and forgot about it until a month later when we got back home, so now it rests in my collection.

The next day we headed for the beach looking for Agates. I had to drive about 25 miles to meet Tobola, as I was staying at a small Village on Route 41. On the way to meet him I had to pass through Ahmeek, so I paid Mrs. Luoma a short visit at the Keweenaw Agate Shop. She has a large stock of Agates and of course I had to pick out a few; it was a good thing that I did as we only found a few and they were pretty poor ones at that. We also found a few Thomsonites and they also were nothing to brag about.

The next day it rained again, but cleared and got warmer by 9 A. M. so we got out our Fly Rods and headed into the Montreal meadows for Brook Trout where we again got seven fish; then they quit

"WE"—Mr. and Mrs. F. R. Klink

biting, so we headed back to the Cottage and started packing to move the next day, as the damp weather was raising cane with my wife's rheumatism. The next morning, July 8th, we bid our friends goodbye and headed west. We stopped for the night a short distance west of Duluth. The next morning we took off again and headed across North Dakota, stopping whenever we saw a likely looking dry wash and poked around for what ever we could find. We collected a few Agates and Jasper from these places and at one place where we stopped for a rest on the highway, I found a beautifully banded Agate in the gravel fill along side of the pavement. This fill was along U. S. 2, east of Devils Lake, N. D. We followed Route 2 across Montana to Havre and then headed south through Great Falls to Helena, stopping whenever we saw a place that looked like it might have something that we wanted and as usual not finding very much that was worth picking up. We were out through this country during the early years of the war and had everything to ourselves including the highways; at that time we traveled for a half a day and never pass another car. John Brodrick, of Clinton, Mass., and Secretary of the Old Timers Mineral Club, made the trip with us at that time, and I am really sorry that he was not with us on this one.

After leaving Helena, we headed for Spokane, and from there south to the city the people there like so well they say it twice, Walla Walla, where we had to root our old friend Post Office George Weber, an ex. post card reader and a member of the Old Timers, out of bed, and mind you that was after 8 o'clock A. M. What a life for a full grown man to live. Ho hum! The best part of it was, that he thought it was some one else rooting him out at that unearthly hour and if he had any thoughts of committing malicious mischief, it would be on the person of one Frank Campbell of Waterford, Mich., whom he was expecting, and not on me whom he was not expecting as I had notified him that I did not expect to see him this year but the wet weather in Michigan changed my mind. Oh, and by the way, the day after we left the weather turned nice and stayed that way. We stayed two days in Walla Walla visiting Weber and another rock hound D. R. Irwin who has a very nice collection of Plume Agate. He does all his own cutting and I will say he does a very nice job, both cutting and mounting in jewelry of his own workmanship. Most of his pieces are in sets of three, two ear drops and a pendant. I was interested in his cutting mainly because he has the knack of orienting his material to get the most out of it. I don't mean quantity, I mean quality. Which is all too often sacrificed in order to get as many pieces out of a rough as possible. Because you have to pay a stiff price for a piece of material is no reason why you should cut a bunch of inferior stones out of it instead of one or two with real class. Weber and we had intended to do some prospecting along the Columbia River, but the water was too high to get to the places we wanted to go to, so we didn't get to do a thing but gab about places we would like to go and dig, one of them the Priday Ranch, which I understand is closed to the public. We finally pulled out of Walla Walla and headed down the Columbia River Highway at a leisurely pace, the scenery is too beautiful to hurry. There are many wonderful waterfalls that hold your interest, also the McNary and Bonneville Dams. The McNary is a long way from being completed, and by the looks of the work done it will be several years before it is completed. We stopped at a tourist cabin in the pine forest just a short ways east of Portland, near Troutdale, Ore. I would give a handful of my choicest rocks for another dinner like the one we had there, chicken and dumplings. If you ever go that way don't fail to look it up. After a good nights sleep we were on our way again, after going in circles trying to get out of Portland, we finally made it after the third filling station direction and headed for Newport on the coast of Oregon. We connected with Route 101 and followed it along the coast although you

could not see the Pacific as it was covered with fog. On arriving at Newport, we inquired as to the time they expected the fog to lift. Well the answer was rather discouraging as we were told it might be a day and then it might be a week as they have fog nearly all of the time and they did not think anything about it. We decided to get dinner and then plan what we would do. After dinner we headed east on U. S. 40 to Corvallis, then south to Eugene, then east again to Bend, all in Oregon. We were now getting into a rock hound's Paradise. In fact we found some very interesting material on McKenzie Pass before we got to Bend. Two of the most interesting things we found on the pass were snow and lava. We couldn't bring any of the snow with us, but we did get a few specimens of lava and several pictures. Just east of Bend we struck a place where they had made a new find of Thunder Eggs and some of the prettiest Variegated Obsidian. We did not get any of the Thunder Eggs and very little of the Obsidian although we saw plenty of the nice stuff in the possession of a filling station operator. I wanted to buy some of the stuff, but he would not set a price on it, saying he just wanted it for people to look at when they stopped for gas. We followed Rt. 40 to where it joined U. S. 30 near Payette, Idaho, then took 30 to Burley where we took 30S to Ogden, Utah, and then east to Little America, Wyo., where we joined up with 30 again, this we followed over the desert and mountains to Cheyenne picking up a few specimens along the way, and by the way, U. S. 30 through Wyoming, is one of the finest pieces of the road builders art that we struck west of the Mississippi river.

Our trip across Iowa will always be remembered like a nightmare, the rain came down, not in drops, but in lumps, so it seemed to us. Then the method of putting the gutters in the edge of the paving instead of making them an extension of it gives you the jitters when it is wet and your wheels climb up on it; you don't know whether you are going to skid and you can only hope no other car is coming. It is the only state that I have been in that uses that type of construction and I hope I never have to drive it again in the rain. It was still raining when we pulled into Aurora, Ill. The next morning when we left Aurora it was still raining cats and dogs. It kept up all day across Indiana and Ohio and did not stop until we pulled up on my driveway at home where we unpacked our rocks and camp equipment, got a good hot tub and then went to bed. The next morning we decided we had not enough so we took off again for a visit with Jack Brodrick and my wife's sister at Clinton, Mass. We spent two days there and in Manchester, N. H., then we headed down through Rhode Island, then across Connecticut and New York to Bear Mountain where we connected with U. S. 202 across N. J. to Norristown, Pa. From there we headed for Washington, D. C. by way of Baltimore, Md. It was so infernal hot in Washington that we left the next morning at daybreak and headed back home by way of Hagerstown, Md., and U. S. 40. When we saw the Ohio Line we were so happy that we took a picture of the marker, then stepped on the gas, arriving home late in the afternoon. Our feet had quit itching, we had enough—7644 miles worth.

Too Many Ad Replies!

Editor R & M:

Please discontinue my exchange ad. I will have to quit advertising as I have had so many repeats that I have quite a time getting caught up.

I have received some wonderful crystals, etc., from New York and New Jersey. I think I heard from over 20 states and everyone a good trade.

Al Thrower
Santa Cruz, Calif.

January 8, 1950

OBSERVING A METEOR FALL TO EARTH

By JOHN S. ALBANESE
P. O. Box 536, Newark 1, N. J.

Meteors that penetrate the atmosphere and make contact with the earth's surface are called meteorites. A meteorite is a mass of mineral matter which has reached the earth from cosmic space. The paths of some meteors suggest that they come from space beyond the solar system; fragments perhaps of an exploded star. With more than 5000 million stars and 10 million stellar systems beyond our own solar system, it is safe to assume that there have been stellar collisions in the past. In fact, our own planets and asteroids were born as the result of such a near-collision, when the gravitational pull of a passing star drew an incandescent filament away from the sun.

Nearly all meteorites appear to be angular fragmental objects; some with sharp, almost squarish angles. Rarely is one found round, or nearly so. Chemically, meteorites suggest that they had an origin similar to that of the earth. Not a single element has been found in meteorites which is not present in the earth's crust. The Canon Diablo, Arizona, meteorite, for example, was found to contain besides iron and nickel, traces of diamondiferous carbon, platinum, iridium, rhodium and minerals with a definite chemical composition, such as Moissanite, Cohenite. A stony meteorite which fell in Melrose, N. M., was found to contain assayable amounts of gold. Other meteoric irons contain traces of manganese, copper, tin, cobalt, chromium and graphite.

Recent studies by lunar observers have established the presence of a thin atmosphere, with clouds, around the moon. Meteoric flashes, that is, the trail of meteors passing through the lunar atmosphere, have been observed and photographed. Oxide minerals have been found in stony meteorites, which lends support to the theory that some celestial bodies have an atmosphere.

A stony meteorite which fell in Maziba, Uganda Protectorate, East Africa, on the 24th of September, 1942, was analyzed and found to contain the following chemical composition:

FeO	16.15%
SiO	38.89%
CaO	2.01%
MgO	26.19%
P_2O_5	0.24%
FeS	4.66%
Iron, Metallic	11.16%
Nickel, Metallic	0.97%
Cr_2O_3	Trace

Note the preponderance of oxide minerals in this meteorite.

Meteorites are of three types: Siderites, with a composition of from 85% to 95% of metallic iron and from 5% to 15% nickel: Siderolites, which contain much stony matter in addition to nickel-iron alloys; Aerolites, whose composition is almost entirely stony matter. The sizes of meteorites range in weight from a fraction of an ounce to many tons. Some of these fall singly, while others fall in compact clusters of small fragments. The Canon Diablo and Northern Siberia meteoric craters were formed by such compact clusters, and not by a single mass.

The depth into which a meteorite penetrates the surface of the earth varies according to shape, weight and velocity of the falling object, and also upon the nature of the ground. Unfortunately, not all meteorites are recovered for scientific study, as three-fourths of the earth's surface is covered with water, and a good proportion of the remaining fourth is covered with polar and glacial ice. It follows that a very small proportion of all meteorites actually fall on land.

Meteorites are most frequently found in arid regions where there is little vegetation. In humid regions, where there is abundant rainfall and vegetation, meteorites bury themselves in soft ground, and in a relatively short space of time become oxidized, and decompose rapidly. Erosion processes eventually obliterate them from view.

Presumably, meteors enter the almost frictionless outer layer of the atmosphere calculated to be about 700 miles high. At lower levels, the air becomes progressively denser, offering greater resistance to the falling meteor. It is estimated that meteors travel at a rate of speed up to 45 miles per second, compressing the air before it. The great friction due to this compression generates heat, which rapidly rises to incandescence. This results in brittle superficial material being flicked off and left behind floating in the air as the trail of the meteor. And so is born the awe inspiring "fireball" or "shooting star."

The atmosphere at lower levels offers greater resistance to the falling body, which creates tremendous pressures estimated to be in the thousands of pounds per square inch. Such high pressures often cause the meteor to explode, some pieces falling miles apart. But the increased resistance of the air at lower levels also acts as a cushion, which results in loss of speed. Sometimes, the "fire" is abruptly extinguished while the meteor is still streaking across the sky. The reduced speed has cooled the meteor, and the thin incandescent outer layer solidified before reaching the ground. The surface of iron meteorites oxidizes to a thin black crust, sometimes not over a millimeter in thickness, while the surface of stony meteorites fuses to a thin crust of glass. Small meteors vaporize or disintegrate entirely and only those with a minimum mass of about ten pounds can survive the heat engendered by the friction of the atmosphere.

The passage of a meteor through the atmosphere is accompanied by a sound somewhat like that of thunder. This is due to the compression of air in front and on either side of the meteor, causing longitudinal waves to be set up in the air. Such was the observation of natives near the town of Soroti, Teso District, Uganda Protectorate, Africa, where an iron meteorite fell on the 17th day of September, 1945.

A Meteor Falls in Uganda

The following description of this fall is from a report of the District Commissioner of Teso, dater September 22, 1945, and forwarded to the Director of Geological Survey at Entebbe, Uganda.

"At almost exactly ten minutes past one on Monday, 17th September, a low rumble, as of thunder, but without claps, was heard. It was, indeed, so similar to thunder that people indoors took little notice for a half a minute. It rose slightly in volume and its persistence soon drew everyone to look skyward. Many thousands of feet high, (a wild guess would be 20,000 ft.) a vapour trail could be seen; similar, I am told by R.A.F. personnel, but larger than, the trail left behind by a jet propelled aircraft. This trail extended half across the sky which was as blue as could be. After about a minute the sound abruptly stopped. The trail disintegrated after about five minutes. Everyone had different ideas as to the direction. I, personally thought North-South, while another European thought South-North. All points of the compass, in fact, were mentioned."

"There was considerable speculation by everyone as to what the phenomenom was, and no small excitement among Soroti's townspeople of all communities. Guesses veered from a meteorite to the after effects of Japan's atomic bombs, and from a jet plane to a huge bomb sent from Europe to destroy all Africa. Local Teso opinion eventually dismissed it as 'shauri ya mungu."

"The correct answer came the next morning when a man from Katine brought in four lumps of what appeared to be pure iron, in parts crystallized, and bearing signs of intense heat. The largest is the size of a man's fist."

"We now go over to the words of a woman from Melok Village, about 3 miles S. W. of Katine, Eten (Gombolola) Headquarters:—'I was sitting in my hut with my three children yesterday morning. I heard something like thunder. As there were no clouds in the sky, I thought there was something harmful. So I went out of my hut and went to a nearby tree

with my eldest son. I told him to kneel down and pray to God. We had just knelt down, when a thing came from the sky and went into the ground near the tree. I and my child were blinded by the smoke for a little while. When we could see again, I went to the place where the thing had fallen."

"There was found a very small crater about a foot deep, and only about three feet from where the woman and her child had been praying. Other pieces of metal were found scattered over a radius of about a mile. The pieces were brought to the district office, and evoked great interest, and some 500 people had seen them within an hour of their arrival in Soroti."

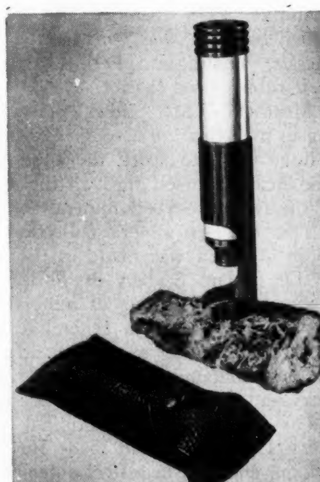
The report goes on to state that two fragments were found at the spot where the woman had been praying, and three other fragments were found about a mile away. Four of these pieces were sent to the Director of Geological Survey at Entebbe, and weighed as follows: 1000 grammes; 700 grammes; 180 grammes; 170 grammes. A total of approximately four and a half pounds. Some fragments were seen to fall in an area covered with swamp, and another area covered with tall grass. These were not recovered. The fall was seen by people within an area of at least 4200 square miles.

The specific gravity of the largest piece was determined and found to be 5.86. Examination showed the fragments to be of two different kinds of material; one a brittle, fairly coarsely crystalline, opaque, non-magnetic and bronze colored substance resembling a sulphide mineral, such as pyrrhotite, and the other, a tough, grayish-white, strongly magnetic and metallic looking substance. The former was analyzed, and found to be Troilite, having the composition of Iron Sulphide, FeS. The magnetic constituent was analyzed and found to consist of 91.13% iron and 8.87% nickel. No other element other than iron and sulphur was detected in the Troilite.

The meteorite is unusual, in that it consists of 65.7% Troilite and 34.3% iron-nickel alloy. One of the four fragments mentioned above was sent to the writer, and now rests in the American Museum of Natural History in New York City.

NEW PORTABLE MICROSCOPE

The Clarkstan Corporation, 11927 West Pico Boulevard, Los Angeles 64, California, announces a new handy portable wide-field microscope—Model 233. This instrument offers laboratory quality for use in the field or shop. Its excellent optics are equivalent to those provided in the pedestal type microscope. The entire field is in focus. It is free from prismatic aberration and has a very high light efficiency.



The magnification range is from 20x to 60x. It is adjustable for any magnification between these figures. All parts are in brass or steel plated and with dulite finish.

The instrument may be carried in the pocket and comes complete in genuine grained cowhide leather case. Price, net $12.75.

PILGRIMAGE TO PHILLY

By O. IVAN LEE
Jersey City, N. J.

On Saturday, February 18th, a group of members of The New York Mineralogical Club journeyed to The Academy of Natural Sciences of Philadelphia, not to collect specimens but culture, and be it said now, the trip was eminently successful.

Dr. Ralph J. Holmes, the president, and Messrs. Helbig, Lit and the writer went down on an early train, and at the entrance to The Academy were cordially greeted by the president, Mr. Charles M. B. Cadwalader and Mr. Harry Trudell representing The Philadelphia Mineralogical Club.

We were conducted to that section of The Academy not open to the public utilized in part as a meeting place for The Philadelphia Club. Here we found Dr. W. Hersey Thomas, president of The Club, and his estimable wife who had set up a private view of selected micromounts for our edification. Soon other members drifted in, and a little later we were pleasantly surprised by Phil Cosminsky who had apparently come up from Washington on the early milk train. Then suddenly the ubiquitous Leonard Morgan, champion club member and jet propelled collector, was with us and finally Messrs. Yedlin and Perloff arrived in their rubber tired chariot.

Meanwhile, Mr. Cadwalader was giving us a fascinating account of how mineralogy came to spark the founding of The Academy itself through the medium of the famous Seybert mineral collection.

This, the first mineral collection formed in America was made in the 1790's by Dr. Adam Seybert of Philadelphia. It marks the beginning of mineralogy in the United States, is a general collection arranged according to Cleaveland's Mineralogy, containing 1725 specimens of rocks and minerals, inclusive of crystals, and is still intact in the original cabinet which Dr. Seybert had made for its reception, enclosed in a steel outer case for greater security.

The acquisition of this collection is contemporaneous with the beginning of The Academy. On the evening of January 25, 1812, the founders met in John Speakman's apothecary shop, odorous with camphor, rhubarb and musk, at Second and High (now Market) Streets. In anticipation of the organization of The Academy, Mr. Speakman had purchased the Seybert collection for $750, a large sum in those days. Shares of $20 were issued to reimburse him for the expenditure, and although subscriptions were at first slow to materialize, the eventual successful effort to honor this debt of honor, led directly to the inauguration of The Academy itself.

The institution was formally organized on March 21, 1812, and soon afterwards a small room was hired at 121 North Second Street. There the collection was installed and Dr. Gerard Troost (after whom troostite is named), a Hollander and first president of The Academy, delivered a course of lectures on mineralogy.

Dr. Seybert (honored by the species seybertite, known, too, as bronzite) was America's first mineralogist. While a student in Paris and Göttingen, he had accumulated a fine mineral collection, into which he incorporated the specimens described in his "Catalogue of some American minerals which are found in different parts of the United States."

Some idea of the importance of this pioneer collection may be gained from the fact that a few years prior to its purchase for The Academy, Benjamin Silliman, newly appointed Professor of Chemistry and Natural History at Yale College, had journeyed by stage-coach from New Haven to Philadelphia to see the Seybert collection.

On arriving in Philadelphia, he lodged at Mrs. Smith's whose house, occupying the triangle at Dock and Walnut Streets, was frequented by Connecticut members of Congress and by Robert Hare, Horace

Binney, John Sargent, George Vaux and Elihu Chauncey.

Silliman had brought with him in a small candle box the entire mineral collection of Yale College—a lot of unlabeled stones. Box under arm, he trudged past the markets of High Street to the shop of Seybert, chemist and mineralogist, at 168 North Second Street, to have them identified. And he went back with the desired information.

In Seybert's catalogue, forty different minerals in the collection were described. He told of a "radiated Zeolite found investing hornblende rock, on the canal near the river Schuylkill, about three and a half miles from Philadelphia." Further, "I have some specimens of marble found in York County which approach those allowed to be the pride of Italy." He announced, in 1806, the occurrence of "sulphuret of zinc" (sphalerite) near the Perkiomen Creek, in Montgomery County, and demonstrated that it would yield zinc metal, resulting in the opening of the Perkiomen mines.

Most of the specimens, however, are from Europe. They are small in size, and sing'e crystals are neatly mounted on small wooden plaques. All are ticketed with numbers referring to the manuscript catalogue, still in excellent condition. The nucleus of the collection may have originated in Freiberg, Germany.

Noteworthy is a specimen of celestite, the sulfate of strontium, a species first described from Blair County, Pennsylvania. There are specimens from the mines of Cornwall, England—some of which have not been worked for 150 years; Iceland spar from Iceland; two specimens of cryolite from Greenland, well known today as a strategic mineral used in making aluminum: "elastic sandstone" (itacolumite) from Brazil, and spinel and silicates in blocks of limestone ejected by Vesuvius.

Benjamin Franklin frequently brought specimens to Seybert for identification, and some of these are still in the collection with labels written by the Great Philosopher.

Mr. Morgan and the writer noted several specimens from Franklin (Furnace), such as spinel and chondrodite, evidently from surface outcrops, but no zinc minerals were seen. These must be the earliest known Franklin occurrences.

Many of the names are archaic. One mineral from Elba labelled "Yenite" composed of several slender crystals projecting from matrix seemed strangely familiar, but it was some time before it was recognized as ilvaite. Dana states that "Yenite" should have been "Jenite" in commemoration of the battle of Jena, in 1806, both the Germans and the French having rightly rejected the name on the ground that commemoration of political hostility or triumph are opposed to the spirit of science.

Some time between 1730 and 1740, an expedition to the Arctic was sent out from Philadelphia, and we were astonished to find in this historical collection, an excellent specimen of labradorite from the same locality as worked today. (Labradorite from Nepoktulegatsuk, *Rocks and Minerals*, 10, 150, October, 1935). Evidently, this world famous locality has been known for well over two hundred years!

We now directed our attention to other sections of The Academy collections stored for study and research, inclusive of thousands of specimens brought back from its expeditions to Greenland, South America and Africa.

It was a rare privilege to inspect and handle such a wealth of specimens as were shown us, but perhaps one of our biggest thrills was had when a drawer in the section reserved for Pennsylvania minerals was pulled out, and there before our unbelieving eyes was a suite of items simply out of this (present day) world. The drawer was filled to capacity with large, glassy supurb anglesite crystals in matrix from the famous Wheatley mine at Phoenixville, Pa., any one of them a collector's dream.

It was now noon, so the party adjourned to a neighboring old time restaurant where we were treated to a most satisfying luncheon. The inner man thus fortified, we resumed our inspection of

The Academy treasures, this time by a guided tour of the public galleries on the second floor. First on the agenda was the gem collection where magnificent representatives of the gem world are splendidly displayed. Each gem is supported by an almost individual glass "spider" which gives the stones the aspect of floating in the air, at the same time insuring ideal lighting.

Some of the Oriental gems were a gift from the Indian poet Sir Rabindranath Tagore, and the carved jade casket in which they arrived is displayed in a special case, a work of art in its own right.

A truly remarkable display in a large adjacent case attracted our attention. It was a very large fulgurite complete with main stem and all its ramifying branches, looking not unlike a miniature bolt of lightning.

Finally, we arrived at the piece de resistance, The Academy mineral collection, each item carefully selected and displayed to typify some species or variety, and the quality of each is enough to make even an advanced collector feel like a beginner again. It embraces not only part of the famous William S. Vaux Collection bequeathed to The Academy in 1882, but selections from a dozen other early collections such as those of Joseph Leidy, Thomas M'Euen, Samuel Ashmead, George W. Carpenter, J. M. Hartman, Thomas Harvey, E. D. Drown and William H. Shaw, to name a few. It is impossible to do justice to such a wealth of wonderful specimens, but the writer can still visualize one item which was like something out of Arabian Nights—an octahedral greenish diamond crystal as large as a hickory nut imbedded in blue ground matrix!

The shades of night were drawing near and all had "museum feet" when we reluctantly turned our thoughts homeward, so bidding our hospitable hosts goodbye, we all agreed that we had had a most enjoyable and memorable day—the kind that lingers long in a collector's mind and memory.

MINERALS OF THE BROOKLYN-BATTERY TUNNEL

By PETER ZODAC
Editor, Rocks and Minerals

The geology of the Brooklyn-Battery Tunnel is discussed elsewhere in this issue by Thomas W. Fluhr. It is appropriate, therefore, that the minerals found in the tunnel should also be given some attention.

The Brooklyn-Battery Tunnel is in New York City. It will be a vehicular tunnel with its northern portal in Battery Park (the extreme southern tip of Manhattan Island) and its southern portal in Brooklyn (on the western end of Long Island).

Quite a number of minerals have been found in the excavated rock from the tunnel but the full number of species and varieties may never be known as no one to the writer's knowledge made any effort to list them all. Most of the following minerals were seen and collected by the writer when on a short visit to the Battery Park dump on Saturday, December 13, 1947.

Albite: Grayish, striated masses with massive smoky quartz.

Albite (*Peristerite*): A large mass of grayish gemmy albite (finely striated and iridescent) associated with muscovite and massive smoky quartz, was collected by the writer. A thin vein of peristerite in mica schist was also found.

Peristerite is a name taken from the Greek word for pigeon, because the colors seen in this variety of albite resemble the colors seen in the neck of a pigeon. Peristerites are especially attractive when polished.

Apatite: Small green crystals found in a vein of smoky quartz in mica schist. See reference 2.

Biotite: Small black flakes with tourmaline.

Chabazite: Interesting crystals. See reference 1.

Chromite: Small black masses in serpentine pebbles.

Cyanite: Some beautiful greenish to bluish platy cyanite in massive milky quartz were found by T. Orchard Lisle, who first reported the occurrence. See reference 2. Mr. Martin Walter, Manager of Hotel Paris, in New York City, also collected some cyanite and he was kind enough to donate to the writer a nice specimen, bluish cyanite in mica schist.

Dolomite: Thin grayish veins in serpentine pebble.

Epidote: See reference 1.

Garnet (*Almandite*): Aside from quartz, garnet is perhaps the most common mineral to be seen on the dump. Very nice specimens of small to large crystal masses in mica schist may be obtained. Dr. A. C. Hawkins found a 2 inch crystal on one of his many visits to the locality (see reference 4). Almandite garnet is dark red in color.

Microcline: Flesh-colored masses with muscovite and smoky quartz (in pegmatite). A large and nice specimen of the microcline was sent the writer by Raymond Conover, of Stone Ridge, N. Y., who had obtained several specimens from a friend working in the tunnel. Along with the microcline was also a nice specimen of garnet in schist.

Molybdenite: In smoky quartz. Found by T. Orchard Lisle. See reference 5.

Muscovite: Silvery-white to blackish plates and flakes with massive smoky quartz. Two large plates, one showing many different inclusions on its edges, were donated to the writer by Raymond Conover.

Orthoclase: See reference 1.

Pyrite: Small masses in mica schist.

Quartz: Massive and smoky, chiefly with muscovite.

Serpentine: Several 2 inch greenish pebbles of serpentine were found by the writer. These pebbles contained chromite and dolomite.

Sillimanite: See reference 4.

Stilbite: See reference 1.

Tourmaline: Some nice black tourmaline crystals in massive quartz were found by T. Orchard Lisle (see reference 3). A nice specimen containing tourmaline, albite, and biotite, was donated to the writer by Mr. Lisle.

References

1. Collecting under armed guard. By Dr. A. C. Hawkins, *Rocks and Minerals*, Feb. 1945, p. 64.
2. Garnets from New York Tunnel. *Rocks and Minerals*, May, 1947, p. 417.
3. Tourmaline from New York Tunnel. By T. Orchard Lisle, *Rocks and Minerals*, Sept. 1947, p. 839.
4. Report of New York Mineral Club activities. *Rocks and Minerals*, Dec. 1947, p. 1136.
5. Molybdenite occurrence at New York Tunnel, By T. Orchard Lisle, *Rocks and Minerals* June 1948, p. 507.

U. S. GOVERNMENT PURCHASES INDUSTRIAL DIAMONDS

WASHINGTON, October 20, 1949—The purchase of 15,000 carats of industrial diamonds for the United States Government's stockpile was announced today by the Economic Cooperation Administration here and in The Hague.

Arrangements for the purchase of the diamonds were made by the Special ECA Mission in Holland with The Netherlands Government. The diamonds were purchased with funds from the special ECA counterpart account in The Netherlands. Ninety-five percent of the counterpart account is used for recovery projects in The Nethelands and five percent is set aside for administration of the Marshall Plan in Holland and for purchases of materials needed by the United States.

The diamond sale to the United States is the latest of a series of such sales whereby the Dutch Government has assisted the United States in obtaining important commodities for its stockpile. Next to the United Kingdom, The Netherlands has supplied the largest amount of such materials to the United States among all countries participating in the Marshall Plan.

Amsterdam, in The Netherlands, long has been the most important diamond center in the world. The purchase announced today was made through normal trade channels in Amsterdam where the diamonds were assorted, sized and classified. The diamonds have been sent to the United States where they will be inspected by a government representative and then placed in the stockpile.

Diamonds, it is pointed out, are important in many major industries and are essential in the metal working field.

A 7,000 MILE AUTO TRIP

By JOHN E. ANDRESS
2617 Country Club Terrace, Rockford, Ill.

Over a period of 60 days, during August and September, 1949, we enjoyed an automobile drive to the scenic wonders of the West, entirely free, out there, from hayfever which prevails in Illinois during those months.

While driving out, we did very little mineral hunting along the way except for a few pickings in Northern Nevada, until we reached Reno. Here there are several mineral and gem shops, but we also spent several days 'prospecting." At Virginia City, we visited an active mill and received specimens of silver and gold ore. This old town is one of renown, for back in 1876 the Comstock Lode was discovered, one of the richest deposits of lode gold ever discovered. It is claimed that the Consolidated Virginia Mine, greatest of the 23 or more mines along the Comstock Lode, has extracted a gross value of some $234,000,000 and is still being worked. Of course, we visited the several mineral and relic displays in the old buildings of the "One Street" town. Northwest of Reno is Crystal Peak. This mountain we climbed and secured nice specimens of terminated rock crystal.

The museum in the old mint building at Carson City proved well worth visiting, both for its mineral displays and for its historic relics. Over the door of the "Smallest Capitol" in the United States (Carson City) are these words—"Into the highlands of the mind let me go."

From Reno, we drove over Donner Pass, via Sacramento and Stockton fruit country (San Joaquin Valley) thro Merced into Yosemite National Park. Plenty of geology here, but not much in mineralogy. However, the writer thinks Yosemite is one of the most scenic and thrilling of our National Parks. From the veranda of the Glacier Point Hotel, as well as from various "look-outs," one gets a grand view of the High Sierras and of the snow glaciers in the cirques. Here the elevation of nearly 8,000 feet overlooks the valley some 3,600 feet below, with sheer walls on either side of the mile-wide gorge. The famous, renowned "OVER-HANGING ROCK" is here. Every evening, immediately adjacent said rock, bark is burned to embers for the "fire fall" after dark. This is a spectacular sight both from Glacier Point and from the valley below. From the Yosemite Lodge on the floor of the valley, over the splendid Wawona highway, thru the 3,200 foot tunnel, the distance is 30 miles up to the "Over-hanging Rock" or Glacier Point. From Chinquapin turn in the highway (about half way up), there is a road going straight ahead to the Mariposa Grove of Big Trees, where *again* (having visited the Grove on two previous occasions) we admired with awe the largest and oldest living things (trees) on earth. "Old Grizzley Giant, estimated 3,800 years old, is 35 feet in diameter at base and 209 feet high. Many other large and taller gigantea Sequoias may be seen in the Mariposa Grove. Interesting rock formations here too for the geologist.

Along the road, just below Sentinel Dome, near Glacier Point, is an outcropping of beautiful white to clear quartz, which is even better than the quality on top of the 8,000 foot Dome, to which we drove and climbed.

Many readers of *Rocks and Minerals* have visited Yosemite, so I shall make no attempt to describe the Park, its matchless scenery, deep canyons, towering cliffs and inspiring mountains, finest examples of erosion in granite by stream and ice action, and the majestic waterfalls, including Yosemite falls, Nevada and Vernal falls.

John Muir described the region as "a revelation in landscape affairs that enriches one's life forever."

At the Government Center, near the Yosemite Lodge, on the floor of the valley, is a free museum of Natural History, in which there are, among many

other displays, regional rocks and geological exhibits of real interest to the geologist.

In order to enjoy the West Coast of Oregon again, after a pleasant month there in 1941, we left Yosemite, driving north from Merced past Mt. Shasta, which, unfortunately, had very little snow on its peak this year in August, thence on to Crater Lake. We arrived there about 3:30 o'clock in the afternoon, on a bright, sunny day. The waters were still (no wind) and the deepest blue color was astonishing and most pleasingly beautiful. From the stone guard wall and side walks on the rim of the crater it is about 100 feet down to the water level. Lake is about one mile in diameter and some 2,000 feet deep. Volcanic lava, scoria, ash and pumice are in evidence in the precipitous walls of the crater all around the lake. Specimens of the volcanic formations were easily available. A small museum displays the local volcanic basalt and felsite.

Beautiful virgin fir and western yellow pine forests were enjoyed as we drove thru, more or less all the way to the Coast via Grants Pass.

We stopped at several towns on US 101, along the Pacific Coast, from two days to a week, enroute up the Coast to Seaside and Astoria. Sandy beaches and rocky shores prevail along all upper Oregon Coast. Our best agate hunting was at or near Seal Rock (post office), which is near the center of the Oregon Coast line. Here we picked up bags of agates, in a wide variety of colors, bands and sizes. We in 1941 had here discovered a strata of sand in the high shore banks, loaded with lime covered chalcedonies. Storms and high tides wash these out, where they may be picked up on the beaches, particularly when the tide ebbs, exposing wide stretches of beach. Normandy Cottages at Seal Rock are very modern and comfortable for housekeeping, offering grand, broad vistas of the ocean and the ceaseless rolling waves. There is no road sign on US 101 at Seal Rock, indicating location of the agate beach. However, Mr. Sims, proprietor of Normandy Cottages, can direct anyone to the entrance about three blocks down the highway, and upon driving in, less than a block, thru dense woods, there is a good parking area, well above the ocean beach. We brought home with us more agates than I can cut and polish, if I were to work all winter. Farther south there are some agates available, such as at or near Bandon and at intermediate places. None equal to Seal Rock.

A sign board reads: "The Ocean beaches are the highways of the State of Oregon." The precaution must be taken of only driving out on wet sands, preferably when tide is out, for cars will quickly mire in dry sand.

Coming homeward, starting on US 20 (most winding and scenic thru the Coast Range and over the Cascade Mountains) we noticed, east of Bend, Oregon, enroute to Burns, a Glass Butte (as marked on maps) off highway. All along the road for ten miles or so in the adjacent territory we were able to pick up nice specimens of obsidian. These nodules and chunks, on fracture showed jet black and others with streaks of reddish brown. Obsidian always breaks with a perfect conchoidal wavy surface, some good enough for the books.

At Little America, Wyoming, time did not permit of search for jade, but we were told that rich chunks had been found within 15 miles from there. We did pick up a few agatized rocks and jaspers on nearby hills, but not as nice as those from the Pacific Coast. The mineralogist and the geologist should spend more time in Wyoming, as well as in other western States.

ARTICLES WANTED

Now that the warm weather is with us again, collectors will be making many field trips. If you take a nice long one, write it up for us. Tell us what you found and where and if possible name the county, also, for each locality. The most popular articles with our readers are those on field trips and especially desirable are they if the writer describe both the localities visited and minerals found.

SO YOU ARE GOING TO MILWAUKEE!

Well, then you are going to have a grand time. Right now you may be sure members of the various committees are working like a rock-hound on his first visit to Horse Canyon. Final arrangements are being made and loose ends are being brought together in order that you will have the most satisfying convention goings-on to date. From the most enjoyable educational programs to just sheer enjoyment in those things pertaining to your hobby have been planned for you. We hope those friends you have not seen since Sacramento will be at the convention to greet you.

Just to play safe, be sure that your calendar is checked for June 28th through the 30th for this third annual national convention of the American Federation of Mineralogical Societies. We don't want you coming a day late.

The Geological Society of Minnesota, the most field-trip-ing-est society in the State under the leadership of Charles B. Preston, the Midwest Federation president, is starting their haunt to the convention early in order to visit the copper region of upper Michigan, where they anticipate picking up specimens and cutting materials. If you have not already planned similar trips be sure to arrange for extra time to do so. At the convention, you will be supplied with a comprehensive guide to collecting areas throughout the Midwest. These collecting spots are places where collecting is still good, rather than places where you could collect in the past. And while we are on the subject of picking up minerals, don't forget to bring that excess material you have to swap. Some one else will be glad to trade with you. Swapping will be a three day delirious binge.

Those societies which publish bulletins are urged to bring copies, as an exhibit of bulletins and a discussion of the problems encountered in their publication is planned.

Do not overlook the unusual attraction of the aerial field trip of which you have been previously informed. This trip, over some of the most spectacular glacial topography in the country, will introduce you to kettles, kames and eskers, and afford the opportunity of taking photographs for future reference. Each group taking the air tour will be briefed by an explanation of what is to be seen with the aid of color slides and maps.

For those who will not be satisfied unless they see some of the more interesting points of this famous city, interesting tours have been planned to parks, industries, and those places which claim to have made Milwaukee famous, will also impress you with their hospitality.

But enough of the side shows. Let us present the important names under the big top. They are: Dr. Richard M. Pearl, who heads the Mineralogy Division; Dr. Gilbert O. Raasch, Paleontology Division; Junius J. Hayes, Geology Division; J. Lewis Renton, Lapidary Division; and Dr. J. Daniel Willems, who will show his $8000.00 movie on the "History of Gems." This film includes his cutting techniques, history of gems and world famous gem localities both here and abroad.

Of course, the foregoing is but the briefest outline of the program.

More likely than not you will pass through Chicago on your way back home. If time permits do not fail to stop over a day or so to see the fabulous gem room, and exciting "Hall of Man" sculptured by Malvina Hoffmann, both in Chicago Natural History Museum, the renowned Chicago Museum of Science and Industry, and the fascinating Oriental Institute, etc.

So you're going to Milwaukee! You'll have a swell time.

National Convention Committee Chairmen

The individuals most responsible for planning for and carrying through to a successful conclusion, the 3rd Annual Convention of the American Federation of Mineralogical Societies, are well known by many throughout the country. For this reason it is believed their many friends will be interested in knowing what they are doing.

Charles H. Preston, President, Midwest Federation (Host) 40 Linwood Road, Excelsior, Minnesota.

James O. Montague, General Convention Chairman, 1026 E. Pleasant Street, Milwaukee 2, Wisconsin.

John F. Mihelcic, Program Chairman, 16543 Appoline, Detroit 37, Michigan.

William J. Bingham, Commercial Exhibits Chairman, 2100 Arcade Street, St. Paul 6, Minnesota.

Hazen T. Perry, Non-Commercial Exhibits Chairman, 2501 Girard Avenue, South, Minneapolis 5, Minnesota.

Herman O. Zander, Local Arrangements Committee Chairman, 849 No. 10th Street, Milwaukee 12, Wisconsin

Arthur O. Gardner, Field Trip Chairman, 3260 No. Holton Street, Milwaukee 12, Wisconsin.

(Miss) Marjorie Scanlon, Favors and Prizes Chairman, 8403 South Langley Avenue, Chicago 13, Illinois.

H. R. Straight, Auction Committee Chairman, Adel, Iowa.

(Mrs.) Loretta E. Koppen, Society Publication Chairman, 3376 Brunswick Avenue, Minneapolis 16, Minnesota.

Andrew Haynes, President W. G. S. (Local Host Society) 173 No. 73rd Street, Milwaukee 13, Wisconsin.

Carl Hub, Convention Treasurer, 1303 No. 44th Street, Milwaukee, 8, Wisconsin.

Ben Hur Wilson, Convention Planning Co-ordinator, 406 Grover Street, Joliet, Illinois.

(Mrs.) Oriol Grand-Girard, Secretary Advisory Committee, Herbert F. Grand-Girard, Publicity Chairman, 817 Mulford Street, Evanston, Illinois.

Herbert F. Grand-Girard
Convention Publicity Chairman

AN INTERESTING EXPERIENCE

By REV. WILLIAM J. FRAZER

304 Academy St., Jersey City 6, N. J.

Last March I had a very interesting experience and it came about because my daughter Sheila, age 12, in 6-B, remarked that they were studying Science and Minerals. My offer to "come over some day with a few minerals" was promptly accepted by the teacher, and on March 28 I spoke and answered questions about Minerals for over an hour, before 50-60 pupils of 6-B and 7-A grades in our Public School No. 11, in Jersey City; the teachers Mrs. W. Freeman and Mrs. V. E. Pell.

I spoke of various characteristic crystal shapes, using the blackboard for sketches, and then gave each youngster a bundle of book mica to examine and "tear apart" and take home.

A huge chunk of calcite with gobs of graphite in it was passed around for all to feel.

Many questions were asked by the youngsters—in fact, they'd have kept us all past dismissal time if I hadn't stopped—which I tried to answer.

Since zinc was one of the minerals they had been studying, I had some zinc ores and an ultra-violet light, and you could well imagine the reactions as the colors appeared. Even with daylight outside, the black shades on the windows enabled fluorescence and phosphorescence to be evident.

I spoke of the huge stones from the Brooklyn-Battery Tunnel which had been dumped in Jersey City in 1947, about which my letter was printed in the July-August, 1949 issue of *Rocks and Minerals*, P. 338; and drew a sketch map on their blackboard so they could find the way to that place. At least ten of the boys have already gone there. Maybe I've developed some future mineralogists.

A few weeks ago my daughter brought home to me two huge envelopes in which I found a note from one teacher and 35 individual letters from the pupils who had heard my lecture.

WORLD NEWS ON MINERAL OCCURRENCES

Items On New Finds Are Desired. Please Send Them In.

Alabama—Mr. Ernest Fairbanks, 10-9th Street, Old Orchard Beach, Me., sends in this bit of information:

"Here is an account of a fine occurrence of turquoise which due to war-time gasoline restrictions I was never able to visit.

"An engineer with the U. S. Bureau of Mines gave me a specimen for identification. I found it to be turquoise and requested a larger specimen if possible for him to obtain same. I found that the late Dr. George F. Kunz had seen this material and stated that it was of fine quality. A reference was also found in the U. S. Geological Survey Mineral Resources for 1902, pp 856-857. Specimen of fine blue color which I identified in 1943 was found on the property of George Hobbs close to the north line of Sec. 3, T2OS, R7E. (a little south of Pleasant Grove Church). Another occurrence is in a railroad cut a few miles northeast of Erin, Clay Co., where turquoise is found as thin veins in graphite schists (Carboniferous). The Erin occurrence is approximately 2½ miles due north of Pleasant Grove Church."

Arizona—Albert L. Fritz, 229 Live Oak Street, Miami, Ariz., sent R & M a number of specimens from the copper mines of his town. The specimens are extremely beautiful consisting of deep blue azurite, dark green malachite, bluish-green chrysocolla and deep black tenorite. When it comes to beautiful minerals, the copper mines of Arizona rank high in the mineral world.

Arkansas—At Eureka Springs, Carroll Co., Ark., beautiful specimens are found of snowy-white drusy quartz which line cavities of gray chert.

California—R. F. Henley, 4075 19th Street, San Francisco 14, Calif., sent R & M two interesting specimens. One is a beautiful chocolate-brown crystalline calcite from the West End quarry, Inyo Co., Calif., and the other is a bluish-white common opal which fluoresces green under the Mineralight. The opal occurs as small masses in a grayish rock and comes from Last Chance Canyon, Kern Co., Calif. An article by Mr. Henley describing the occurrences of the two minerals may appear in the next issue of R & M.

Colorado—Dr. C. N. Eddy, National State Bank Bldg., Boulder, Colo., sent R & M a very fine specimen of black, crystallized ferberite from the Conger Mine, near Nederland, Boulder Co., Colo. It is good to know that fine specimens are still available from this noted tungsten area.

Prof. Richard M. Pearl, Colorado College, Colorado Springs, Colo., sent R & M a nice sample of dune sand from the famous Sand Dunes of Saguache Co., Colo. (The dunes extend also into Alamosa Co. to the south). The sample is a dark brown and reddish fine-grained sand consisting of about 22 minerals of which garnet and quartz seem to be the most common. Along with the sand, Prof. Pearl sent a list of minerals known to occur in the Great Sand Dunes National Monument of Saguache and Alamosa Counties, Colo.—monazite, garnet, chlorite. pyroxene (augite, diopside, hypersthene), amphibole (hornblende, lamprobolite), olivine, magnetite, ilmenite, hematite, feldspars (microcline, orthoclase, albite, oligoclase, anorthite), quartz, mica (biotite, muscovite) obsidian and gold???

Who would suppose that Colorado, the most mountainous state of the Union, contains sand dunes which extend for many square miles!

Connecticut—At the limestone quarries of Canaan, Litchfield Co., Conn., tremolite is found in large snowy-white masses

which at times make beautiful specimens. Beautiful though this tremolite may be, it is made up of extremely fine needle-like crystals which prick the fingers easily and thus are most annoying to handle.

Delaware — Near Middletown, New Castle Co., Del., vivianite was once found in fine large crystals which were colorless but on exposure to air turned blue. The crystals occurred in green sand (marl). Can anyone supply information on the occurrence?

District of Columbia—On a recent visit to Washington, the Editor of R & M noted many brownish pebbles in the concrete sidewalks of the city. The pebbles resembled in appearance the brown jaspers which are extensively used in concrete walks, roads and walls in the Mississippi Valley. On 17th Street, N. E., a small pile of loose pebbles were seen but on examination not one jasper was found—they were all common quartz stained brown by limonite.

Florida—At Daytona Beach, Volusia Co., Fla., grayish coral sand was found in a new well dug in the city. A small sample of the sand was sent R & M by Mrs. Rena Allen, 151 So. Penn. Dr., Daytona Beach.

Georgia—Specimens of rutilated quartz (clear quartz with hair-like crystals of rutile) have been found in Georgia at the following localities: Cherokee County —2½ miles northeast of Ball Ground, 1 mile northwest of Cherry Grove School; Fayette County—near Fayetteville: Fulton County—near College Park. (Georgia Mineral Society *News Letter*, Jan.-Feb. 1950, p. 10).

Idaho—Very nice specimens of yellow-brown opalized wood have been found near Cambridge, Washington Co., Idaho.

Illinois—Donald Stanley, 1135 N. Latrobe Ave., Chicago 51, Ill., contributes the following item:

"We make weekend excursions to the Wilmington strip mines where we find the usual fern fossils and some spectacular pieces of native sulfur in feathery forms, very delicate, which crystallize from gas. The gas is given off from smouldering heaps of waste coal resulting from spontaneous combustion. Bright red hematite (red ocher) is also found with the sulfur, the red and yellow making a pleasing color combination. A wealth of odd glacial pebbles are found here in the spoil heaps. One of the most beautiful collections I have seen consists of glacial boulders sawed in half and polished. The patterns and colors of the various igneous and metamorphic rocks are striking."

The coal mines at Wilmington, Will Co., Ill., are famous for their fine fern fossils.

Indiana—At Borden, Clark Co., Ind., colorless dogtooth crystals of calcite occur in vugs in a dark gray fossiliferous limestone.

Iowa—A. J. Alessi, 430 S. Highland Ave., Lombard, Ill., sent R & M recently about 6 lbs. of pebbles from the gravel beds of Bellevue, Jackson Co., Iowa. Among the minerals noted in the lot were: biotite (black flakes in granite), epidote (green, in granite), limonite (dark brown pebble), marcasite (tiny flat crystals in rock), microline (reddish in pegmatite), muscovite (white flakes in granite), opal (small, white cacholong pebble), and the following quartz minerals—agate (grayish pebbles), basanite (black pebbles), carnelian (red pebble), chalcedony (gray pebbles), jasper (red, brownish red, and yellow brown pebbles), milky (pebbles), oolitic (creamy-white pebble), petrified wood (dark brown pebble), and smoky (pebble).

These pebbles varied from tiny up to those 2 x 2 inches in size and indicated clearly that the material had been scooped up. Heretofore we would have frowned on the idea of scooping up pebbles but now we are in favor of it and especially if one is "in a hurry". Examine carefully the pebbles picked up on a trip to a gravel pit, if you have the time, but bring home also a few pounds

of scooped up material. You may have many pleasant surprises when the scooped up material is examined at leisure in your home! The batch of pebbles sent by Mr. Alessi surprised us in more ways than one.

Kansas—Crystallized celestite has been found near Mentor, Saline Co., Kansas.

Kentucky—Almandite garnet occurs in small red crystals in the peridotites near Fielden, Elliott Co., in Eastern Kentucky.

Louisiana—Lovett Word, Box 1129, Leesville, La., sends in the following:

"We have the most beautiful white crystalline sands in our streams and hillsides. Quite a bit of it will make glass. We have never had but little of it assayed and some of it showed up with a little gold. We have a heavy clay here that carries quite a bit of "flowers of gold," according to assay reports."

Maine—Mr. I. S. Skillin, Freeport, Me. donated to R & M a very nice polished slab of graphic granite which comes from Bradbury's Mountain at Pownal, Cumberland Co.; Opal (hyalite) colorless crust on pegmatite from Topsham, Sagadahoc Co.; and autunite, small greenish scales on pegmatite, also from Topsham—all in Maine. The hyalite and autunite fluoresce green under the Mineralight.

Mrs. Ralph Wentworth, 135 Maine Ave., Portland 5, Me., donated to R & M a dark reddish pebble of andalusite from Bailey's Island, Casco Bay, Cumberland Co., Me.

Mrs. Constance Trott, 36 Mt. Vernon St., Gardiner, Me., donated to R & M a number of dark reddish-brown jasper pebbles from Jasper Beach, near Machiasport. Washington Co., Me.

Maryland—On a recent visit to Washington, D. C., by the Editor of R & M which included a stop in Landover, Prince Georges Co., Md., quite a number of limonites were seen in Landover. The mineral occurred in thin brownish masses in the ditch bordering the road, almost opposite the post office.

Massachusetts—Beautiful specimens of pinkish margarite on emery are still to be found at the abandoned emery mines in Chester, Hampden Co., Mass. The best specimens occur at the Old Mine.

Michigan—A nice dark grayish cephalopod from the world's largest limestone quarry, located in Rogers City, Presque Island Co., Mich., was donated to R & M by Cal O. Gettings, 2001 Starr Ave., Toledo 5, Ohio.

A cephalopod is a fossil and the specimen donated is a large snail-like type which was collected recently by Mr. Gettings.

Minnesota — Howard E. Jackson, Moose Lake, Minn., has found pebbles of green plasma (quartz) in a large gravel pit located 2 miles southwest of Moose Lake. He also found a large pebble, weighing 1¼ lbs, of bloodstone, at a locality 1½ miles northwest of Carlton, Carlton Co., Minn. A beautiful cabochon of the bloodstone was donated to R & M. It consists of large blotches of deep red jasper imbedded in a greenish plasma.

Mississippi—At Plymouth Bluff, 4 miles above Columbus, Lowndes Co., Miss., in the sandy beds of the Eutaw formation which are highly fossiliferous, many very fine specimens of ammonites may be found. These fossils are often of enormous size, coiled like a ram's horn, and of excellent quality.

Missouri—T. A. Patterson, RR1, Granby, Mo., sent in the following item:

"Calcite crystals of various size and different colors are of common occurrence in the zinc mines at Granby, Mo. Besides these, there also occurs a rare form of columnar calcite which has parallel layers of different colors. The layers are arranged in straight lines and are similar in appearance to the straight and banded agate. This unusual form of calcite has become known as "Granby Onyx."

Montana—Loose, olive-brown vesuvianite crystals are found in the Scratch Gravel Hills near Helena, Lewis & Clark Co., Mont.

Nebraska—Nice brownish agate pebbles are found at Linwood, Butler Co., Nebr.

Nevada—Nice red masses of cinnabar on dark gray quartzite have been collected in the Pilot Mountain district, Mineral Co., Nev.

New Hampshire—A nice specimen of pyrite (massive and crystals) with galena in massive milky quartz, from the abandoned Dodge gold mine, at Lyman, Grafton Co., N. H., was donated to R & M by Julian Wetherbee, 22 Wheelock St., Keene, N. H.

Mr. Wetherbee visited the locality some few months ago and reports that the Dodge mine has a tunnel with tram track, quite an extensive dump, and the remains of several buildings.

"We gathered a lot of specimens showing quite a number of metallic minerals. Chalcopyrite is abundant, some galena cubes, and I think, possibly, both graphite and molybdenite. I failed to find any traces of native gold," he further reports.

Ankerite (brownish, crystallized) with tiny rock crystals, on limonitic stained quartz, and dolomite (gray, crystalline) were other minerals sent in by Mr. Wetherbee.

New Jersey—Nice greenish crystals of apatite have been found recently in the abandoned limestone quarry at McAfee, Sussex Co., N. J.

New Mexico—A nice specimen of red carnelian (quartz) was sent R & M by Alfred M. Perkins, Casa de Las Cruces, Las Cruces, N. M. The locality is the Aleman Ranch, northeast of Rincon, Dona Ana Co.. N. M.

A large but beautiful specimen of pink muscovite on white albite, from the Harding mine, near Dixon, Taos Co., N. M., was donated to R & M by Fred G. Knowlton, Gen. Del., Bayfield, Colo.

New York—Brown, gemmy crystals of barite on crystallized black hematite have been found near Edwards, St. Lawrence Co., N. Y. The exact locality is not known.

North Carolina—A few months ago Mrs. Rena Allen, 151 So. Penn. Dr., Daytona Beach, Fla., visited the Cranberry iron mine at Cranberry, Mitchell Co., N. C. A number of specimens collected were donated to R & M and among them were epidote, (pistachio-green mass with magnetite and smoky quartz), magnetite (black, crystalline), orthoclase (flesh-colored masses), pyroxene (black augite with epidote), quartz massive (milky and smoky and both with epidote).

North Dakota—Very dark brown, heavy masses of jasper, occur at New England, Hettinger Co., N. D.

Ohio—C. O. Gettings, 2001 Starr Ave. Toledo 5, Ohio, reports the finding of nice pyrite in his state.

"Large pyrite "balls" up to 3 feet are found in the bank of the Huron River near Monroeville, Huron Co., Ohio. The smallest pyrite "balls" I saw were 2 feet in diameter so I didn't collect any. There may be smaller but the only time to collect is in the fall when the water is low.

"Very good pyrite crystals of cubo-octahedron form are found in a railroad fill near Sandusky, Erie Co., Ohio. These crystals are lightly coated by limonite and equal the Utah pyrites. The crystals come from a private farm and the site has been flooded—probably now it is a duck pond!"

Oklahoma—Ash Lovett, Box 96, Mangum, Okla., sends in a follow-up on an item which appeared several months ago. Writes he:

"In the Jan.-Feb. issue of R & M you told of the supposed hornblende specimen which I sent to you to have been hematite. I thought perhaps you would be interested to know that while searching for quartz crystals last week I found some pegmatite in the process of decomposition. I found several specimens of quartz crystals, but on one piece of pegmatite I found quartz crystals, feldspar crystals, and hematite crystals. The hematite was in small black crystals and was

by far the prettiest specimen of the day. I also found several nice biotite crystals, however these were so fragile that I got home with only one in good shape."

All the above, including the specimen mentioned in the Jan.-Feb. issue, come from the Wichita Mts. of Greer Co., Okla., not far from Mangum.

Oregon—Nice masses of pinkish rhodonite come from a locality near Grants Pass, Josephine Co., Ore.

Pennsylvania—In sending in the note on turquoise in Alabama, Mr. Ernest E. Fairbanks, 10 9th St., Old Orchard Beach, Me., includes the following item:

"Incidentally I have not found out if the turquoise occurrence in Pennsylvania has been visited within recent years by collectors. The material was originally named coeruleolactite but was later found to be turquoise. This was found in East Whiteland Township, Chester Co., Penn. If anyone has any additional information collectors would be interested to obtain same."

Howard V. Hamilton, 187A Franklin Ave., Vandergrift, Penn., recently collected some very fine specimens of bluish fibrous celestite at an old limestone outcrop at Bellwood, Blair Co., Penn. We hope to print soon an article on the occurrence that has been prepared by Mr. Hamilton.

Rhode Island—Botryoidal dark brown drusy goethite masses on massive quartz occur on Diamond Hill, Providence Co., R. I.

South Carolina—Loose, rough crystals of corundum have been found in the soil near Laurens, Laurens Co., S. C.

South Dakota—Some very nice brownish, gemmy masses of andalusite, in biotite, have been donated to R & M by W. L. Roberts, Rise Bldg., Rapid City, S. D. The andalusite is found at Berne, Custer Co., S. D.

Tennessee—Very nice pyrite "balls", some 3" or over in diameter, have been found at Cerro Gordo, Hardin Co., Tenn.

Texas—Nice reddish banded agate is found near Stinnett, Hutchinson Co., Texas.

Utah—Nice specimens of reddish petrified dinosaur bone from San Rafael Swell, Emery Co., Utah, have been donated to R & M by Oliver Mason, 330 23rd St., Ogden, Utah.

Vermont—Nice specimens of chalcopyrite with pyrrhotite occur at the copper mines at South Strafford, Orange Co., Vt.

Virginia—Nice specimens of black allanite come from the northwest slope of the "Bald" Friar Mt., 6 miles north of Lowesville, Amherst Co., Va.

Washington—Very nice specimens of grayish-white cellular, felted masses of mountain leather (amphibole) occur in the Josephine mine, Metaline Falls, Pend Oreille Co., Wash. One fine specimen was donated to R & M some months ago by Charles O. Fernquist, W. 333½ Riverside Ave., Spokane 8, Wash.

West Virginia—Purple fluorite occurs in a limestone quarry 1 mile east of Ronceverte, Greenbrier Co., W. Va., also found in a limestone quarry near Oak Flats, Pendleton Co.

Wisconsin — Nice slender stalactitic masses of marcasite are found at Benton, Lafayette Co., Wisc.

Wyoming—A nice specimen was recently donated to R & M by John S. Albanese, P. O. Box 536, Newark 1, N. J. It consists of small flakes of native gold in massive milky quartz and comes from the Golden Clover mine, Encampment, Carbon Co., Wyo.

Alaska—Nice specimens of molybdenite as small flakes in reddish granite come from St. Lawrence Island, 25 miles southwest of Gambell on the Seward Peninsula, Alaska.

Argentina — Beautiful specimens of bluish, crystallized linarite, come from the Esperanza mine, San Antonio de los Cobres, Los Andes Province, Argentina.

Australia—Topaz, as colorless water-worn pebbles, are found at Stanhope, N. S. W., Australia.

Austria—The Dirstentritt lead-zinc mine, northwest of Innsbruck in the Tyrol, is one of the oldest mines in Austria, being mentioned for the first time in 1585. The mine is on the eastern slope of the Aelpes Kopf mountain, which is 7,200 feet high.

Bahama Islands—Salt is the most important mineral produced in the Bahamas and it comes from evaporated sea water. A little lime is also produced from limestone quarried in the Islands.

Belgian Congo—Large quantities of renierite, a sulfide of germanium, have been discovered in the Prince Leopold copper mine at Kipushi, Belgian Congo.

Canada—Robert Hadden, Aldersyde, Alberta, Canada, sends in a short note on a cave located in the Porcupine Hills in southern Alberta. Apparently it is a newly discovered cave and has been named "The Mystic Cave" from the mysterious painted writings seen on the walls and ceiling. Indians of the area deny all knowledge of the cave and of the painted writings which resemble ancient Semitic characters. Symbols in Mystic Cave and symbols on old carvings in Arabia seem common to the same alphabet shown in Encyclopedia Britannica of 1936.

Mr. Hadden adds the following to his letter—"If any of your readers would be interested in the cave, I would be pleased to take them out to it. It is about 10 miles west of the Duke of Windsor's Ranch, on a good road."

Ceylon—Ilmenite, monazite, and zircon are found in great abundance in the beach sands at several points along the coasts of the island. The largest and most important of these black sand deposits is on the northeast coast at Pulmoddai, 35 miles north of Trincomalee and is said to contain at least 4 million tons of sand. The deposit contains about 75% ilmenite; of the remaining 25%, more than half is rutile and more than a third zircon, and the remainder is garnet, spinel, magnetite, quartz and traces of monazite. (Bureau of Mines *Mineral Trade Notes*, Feb. 1950, p. 25).

Cuba—At the Delita gold mine on the Isle of Pines, Cuba, the following are some minerals which have been found—arsenopyrite, boulangerite, galena, graphite, limonite, quartz, sphalerite and talc.

Cyprus—At the Louvara chrome mine, chromite occurs as small black grains finely mixed with dark serpentine, and is dark brown in appearance. Bronzite, chlorite, diallage, olivine, and talc are some minerals found in the mine.

The Louvara mine is on the Kakomallis Mountain (3,284 feet) between the villages of Apsiou and Louvara, in Limassol district, about 10 miles north of Limassol, in the southern part of Cyprus.

Egypt—A deep green gem crystal of peridot from St. John's Island, Red Sea, Egypt, has been donated to R & M by Dr. C. H. Barlow, Cairo, Egypt. St. John's Island, in the Red Sea, is the world's most famous locality for large gem quality peridot.

England — Bluish, fine crystalline masses of anhydrite come from Cropwell Bishop, Bingham, Nottinghamshire, England.

France—Tin-white crystalline masses of native antimony are found at Allemont, Isere (Dauphiny), France.

Germany—Good, gemmy masses of rose quartz, come from Rabenstein, near Zwiesel, Bavaria, Germany.

Greece—Colorless crystals of fluorite associated with black-brown crystalline hematite occur on Seriphos Island, Greece.

Greenland—Dark green, almost black, crystals of aegirite are found at Narsaruk, Greenland.

India — The Mawchi mine, east of Toungo, in the Karenni State, Burma, is said to be the world's largest tungsten mine and is believed to be the third largest tin mine.

There is an emerald deposit in India about which not a great deal has been known or published. The emerald mine at Kaliguman, Udaipur, Rajputana, was described briefly in an article by Dr. H. Crookshank who at that time was with the Geological Survey of India but now is director of the Geological Survey of Pakistan. The article, entitled "Emeralds in Mewar," was published in *Indian Minerals,* January 1947 (pp. 28-30). This publication is a popular occasional periodical published by the Geological Survey of India.

Kaliguman or Kala Guman, a small village in Udaipur district, State of Rajasthan, is midway between Amet and the celebrated fortress of Kumalgarh. The neighborhood contains mica deposits, some of which are being worked, but was not known for beryl or beryl gems until during the war, specimens of a light green beryl brought to Sir Bhagehand Soni of Ajmer stimulated prospecting and led to issuance of a mining concession from the Mewar Durbur. Almost immediately, Crookshank writes, the concessionaire and his associates took out a "large quantity" of emerald crystals ranging from 0.5 to 4 inches in length and up to 1.25 inches in diameter. Half of these were disposed of at public auction some months later. Crookshank, who inspected the mine at that juncture, writes that the country rock is a "normal hornblende schist" in which are bands of emerald-bearing biotite rock, the bands he saw had a pit opened on them 100 yards long and 60 feet deep. "The emeralds occur through the biotite much like garnet or andalusite in similar rocks." He points to the neighboring pegmatites and conjectures that the beryl (emerald) had been introduced thence into the environing biotite bands. (Bureau of Mines *Mineral Trade Notes,* Feb. 1950, p. 38).

Ireland—In the Croghan Kinshela Mountain, in Wicklow, Ireland, placer gold has been mined for many years and at times very fine nuggets have been found.

Italy—Very fine colorless selenite crystals are found at Cesena, (Romagne), Emilia, Italy. Some crystals occur with brownish spots due to enclosed bitumin.

Japan—Mrs. Grace Beckwith, c/o Mrs. Stephen Blake, Kittery Point, Me., donated to R & M some beach sand from Wakayama, Kii Province, Honshu Island, Japan. The material is a coarse gray sand and consists largely of basanite, chalcedony, milky and smoky quartz.

Mexico—Beautiful specimens of colorless apophyllite on amethyst are common in the silver mines of Guanajuato, Mexico.

Norway—The only graphite deposits in Norway that are being worked at present lie on the island of Senjaen, north of Langoe Island (in northern Norway).

Another occurrence of graphite are old deposits which were worked many years ago. These lie on the island of Langoe. Known as Jennestad, the deposits are on the east middle coast of the island, which is one of the Lofoten Islands. The Jennestad deposit consists of flakes and amorphous graphite.

Panama—A specimen of deep green moss agate from the Pacific end of the Panama Canal, Panama, was donated to R & M by Charles Worbs, Box 1, East Liberty, Ohio.

Poland—Large deposits of white, red-veined, green and violet marble have been found in Stronie, Lower Silesia, near Ladka Zdrouju, Poland. The marble is said to take an excellent polish.

Scotland—White, foliated masses of brucite occur at Swinnaness, Unst Island of the Shetland Islands, Scotland.

Siam—Before World War II, Thailand (Siam) exported zircons, chiefly to Asia and Europe for re-export; the end of the war, however, brought a new era to the zircon industry, based upon direct trade contacts in the United States. In the United States, the Thai zircons found a boom market in 1947, but in less than 2 years the bubble burst. Bangkok, Thai-

land, cutters now predict that if the present export volume is not increased soon, it may be impossible to keep the industry alive.

According to local jewelers and exporters, Thai zircons are among the finest in the world. They are mined in the provinces of Chantaburi and Ubonrajathani, situated in the southeast of Thailand along the Thai-Indochina border. There appears to be no organized industry in that remote section of the country; the zircons are mined by the inhabitants as a sideline activity. (Bureau of Mines *Mineral Trade Notes,* Jan. 1950, p. 42).

Spain—Good crystals of pyrite are found at Caravaca, Murcia, Spain.

Sweden—The finest native lead specimens known are found in the manganese mines at Langban, Wermland, Sweden.

Switzerland—Thin, black, sheaf-like crystals of fasciculite (amphibole) with red garnet crystals in mica schist, are found on the south side of St. Gotthard, Kanton Tessin, Switzerland. A nice specimen was sent R & M by Dr. P. Staehelin, Bernerring 64, Basel, Switzerland.

Tanganyika—Deposits of kyanitiferous sands have been recorded from Galigali in the Usagara Mountains, about 30 miles south of the Gulwe station on the Central Railroad near the escarpment north of Iringa, also at Idibo, 63 miles from Kimamba on the Central Railway. Greenish crystals are associated with quartz. Idibo is lat. S. 6° 2' and long. E. 37° 4½', connected by an easy 4-mile road with the main Kilosa-Dodoma road. The occurrence consists of alluvial deposits derived from kyanitiferous schists and gneisses of the Basement System. The kyanite occurs as columnar and bladelike crystals disseminated in biotite-schist and biotite-gneiss, but it also forms the main ingredient in small lenses of kyanite-quartz rock and kyanite-rock. It was estimated that some 177 short tons of first-quality (kyanite 80%) and some 509 short tons of second-quality (kyanite 69.5%) concentrates could be obtained. So far as is known, kyanite is confined exclusively to the LBC. (Bureau of Mines *Mineral Trade Notes,* Oct. 1949, p. 31).

A body of solid pyrite, 650 feet long and 52 feet wide, has been found in Tanganyika. The deposit is about 2,000 feet southwest of the European cemetary at Samina, a little over 5 miles southwest of the Geita mine. (Bureau of Mines *Mineral Trade Notes,* Oct. 1949. p. 38).

Uganda—A nice bluish mass of azurite with malachite from the copper mines near Kilembe, Toro, Uganda, Africa, was donated to R & M by John S. Albanese, P. O. Box 536, Newark 1, N. J.

Venezuela—A most interesting article "Cerro Boliver—Saga of an iron ore crisis averted" appeared in the February, 1950, issue of the *Journal of Metals* (published by the American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 18, N. Y.) This article concerns the important deposits of iron ore in Venezuela which was discovered by U. S. Steel Corp. in 1948. This 16-page illustrated article has been reprinted and copies may be obtained on request to J. Carlisle MacDonald, Assistant to Chairman, U. S. Steel Corp., 71 Broadway, New York 6, N. Y.

Wales—Thin reddish tabular crystals of brookite are found in cavities in diabase near Tremadoc, Caernaven Co., N. Wales.

THE MICRO-MOUNTER

Conducted by LEO N. YEDLIN, 557 W. Penn St., Long Beach, N. Y.

That address above, for the past 2 years a sort of clearing house for those interested in the fine sport of smaller and finer mineral specimens, will change abruptly. We've sold our domain, and because the business of feeding one's family is still the dominant factor in life (our life, anyway), we are shifting to new realms. Not far, perhaps to Connecticut. But the details haven't yet been established.

The micromounter builds houses for a living. (Yes, we're a member in good standing of the New York Bar, and still practice law when it involves real estate. But sitting around an office or courtroom long ago ceased being entertaining.) And in building, something always turns up when digging a foundation, and the natural choice was obvious. And Connecticut is full of minerals. And so . . .!

We'd like to acknowledge in detail all the letters and specimens received from readers of our column. From time to time we do, or quote from letters, or include whole works of m/m writers. We ask that they who have written, or sent minerals, or asked questions, and whose names were not mentioned in the works be not offended. We're really and truly interested in everyone who has any interest in our hobby. Sometimes the missives bring smiles. Sometimes we sit for nights trying to dope out some questions asked by an interested reader. And once we got mad as, well, anyway, pretty mad, at what someone said. But we appreciate the letters. Please keep 'em coming.

Our two most ardent contributors, both from the point of view of words and specimens, have done it again. A long letter and minerals from Paul Desautels, and minerals and a letter from Lou Perloff. Lou's missive follows:

"The text for today will be a switch on the old saw about there being nothing new under the sun. By reverse paraphrase it comes out as there's always something new under the microscope. The other day I was working with some vanadinite from the San Carlos Mine, Chihuahua, Mexico. Now, vanadinite is one of the old reliables you come across very early in your micromounting experience. Like its group-members, apatite, pyromorphite and mimetite, it shows a remarkable diversity of color and habit. After you've added it from about a dozen localities, you become very choosy about mounting any more vanadinite, unless it's something really special. So it wasn't with any great expectations that I took my first look at this last piece of material. The following is a partial list of the things noted.

"Color: red, orange-red, honey brown, lemon-yellow, black (surface) and many intermediate shades and mixtures of the colors listed. Form: simple hexagonal prism and base; doubly-terminated prisms with acute pyramidal extremities; prisms and pyramids of the 3rd order; skeletal prisms and others showing a pronounced concavity of the basal plane; barrel xls with short pyramids beveling the edges between prism and base; short prisms and base, with the length of the prism about ¼ of the diameter of the base. Color shading within xls: brown prisms with canary-yellow base; transparent yellow-brown prisms shading to red at one or both extremities of the xl; phantom shading, with a series of concentric hexagonal outlines, with shifting color visible through the basal plane. In addition, some of the xls of vanadinite were invested by minute, transparent rhombs of Iceland spar, while other parts of the specimen showed minute vanadinites on clear quartz.

"Most interesting fact of all was that the specimen in which all this could be seen measured 1½ by 1½ inches. I got it at Ford's for fifty cents. All of which makes me wonder not why more people don't go in for micromounts, but why collectors go in for anything but micro-

mounts. One would have to go through a whole drawerful of cabinet specimens to come upon the world of beauty hidden in this fragment. More than this, one would have to read pages of text for the equivalent of the things learned of crystallography and mineral genesis. Surely, one of the most fascinating things about the hobby is the sense of wonder as the mind seeks to grasp what the eye sees. How account for this remarkable diversity of color and habit in a group of xls formed at the same time within the same tiny area? For all the inexorable laws of crystallography, it seemed almost as if there were something feminine in this attempt to escape sameness.

"If all this seems a bit fanciful and unscientific, then I'll have to admit sadly that it's the way my mind works. The quest for knowledge consists of asking questions. Some of them get answered; others don't. Some of them, in the nature of things, will never get answered. But there's still fun in asking. The ones I feel sorry for are the non-askers, the sitters - in - front - of - television. the ones who've turned to picture books because reading is too much of a strain, the ones who tell you, "It must be wonderful to have a hobby, but I don't know wher I'd ever find the time for it."

"Now, let's see, where were we? I know that you constantly get letters from people who quite readily admit that micromounting sounds peachy, but how does one get started? The cost of a microscope is still prohibitively high for most collectors. In the larger cities, one may, by stalking the hockshops and curio stores, occasionally turn up a second-hand instrument. But even those are plenty expensive. And so the quest would seems to be stymied at the outset; no microscope, no micromounting. But I still think there's a great deal to be said for starting, if one has to, with even a pencil-type microscope. Harry Ross once advertised a simple tube holder for eyepiece and objective that is certainly within the price range of everyone. Even with the simplest instrument the starting micromounter can begin to classify and store the likeliest looking material against the happy day when he at last gets a binocular to work with. At least, he'll be able to assure himself that we microscopists aren't making up most of the stuff about what we see through the microscope. And at the same time he'll be learning things about minerals at a clip he'd never have believed possible.

"The next question in point of frequency would seem to be: "What is a micromount?" From some of the ads I occasionally see, even some of the dealers don't seem to know. Someone, recently, was advertising jewel sand as micromount material. Whatever jewel sand may be good for otherwise. it most indubitably is not m/m material. By the time even the most precious gem mineral has been beaten down to the sand state, it may still be interesting for study purpose, but no micromounter in his right mind is going to make an m/m of it. I may be finicky, but in the four years I've been at it, I have yet to make a mount of uncrystallized material. If a mineral doesn't occur in crystals, that's tough. The collection will have to do without it. The non-micromounter would be amazed at the relatively few minerals that don't show xls under the microscope. Take bornite—how many collectors have ever seen xls of it? It's a commonplace item to the micromounter.

"Having agreed on crystallization as a first requisite (Groucho Marx used to say you'd run up a perfect score if you kept on answering yourself) the next question is: "How good a crystal?" Let's take care of the part of the question that can be answered categorically. It should not be bruised or broken, if a single crystal. In a crystal group or aggregate a broken xl in the unit lowers its value to the same extent that it does in a hand specimen. (The micromounter can occasionally overcome this by orienting and setting the mount in the box so that the broken part is not displayed.) Where the xls are discrete individuals, an effort should be made, where possible. to get rid of the bruised or broken xls by careful pinwork. Often this can be done so that no

trace remains to mark the excision.

"I think par for the course is a mount I once made of a dioptase from Guchab, S. W. A. Sprinkled on quartz were about a half dozen xls, only one of which was perfect. Since that one was doubly-terminated and set in the center of the matrix, I thought it worth while to essay a bit of surgery. Four or five pins later, the operation was a success. As mounted, one good xl rests in the center of the quartz, with nothing to show that it ever had any neighbors. Do I hear a question from the audience, "Is it worth while pitching all this woo at every micromount?" By no means; the amount of affection you'd lavish on a dioptase or a proustite you wouldn't dream of wasting on a pyrite or some other microscopic plain sister.

"One of the cliche's of micromounting is that you can most always sweet-talk your cabinet specimen friends into knocking off corners of their hand specimens, which you can then use for m/ms. This member of the court must register a sharp dissent. Not only do you irritate your friends, but you soon discover that the xls on the exposed corners of a specimen don't amount to much as m/m material. Lesson No. 2 in crystal quality: only the clean material inside a specimen, which is exposed for the first time when you break it, is acceptable first-grade m/m quality. You get into the habit of playing hunches. If the specimen is veined or cellular or amygdaloidal, the chances are fair that the mineral crystallized in the surface cavity will be found again inside. Does a guarantee go with this method? It most certainly does not. Part of the time you'll get nothing for the effort and you'll want to kick yourself for having sacrificed the sure thing on the surface for the will-o-the-wisp inside. But when you do hit paydirt, you'll find yourself blushing in rosy confusion over the pretty things you're saying to yourself about what a smart old thing you are. (Ed. note: Tush, Tush!)

"One last illustration and I'm through. On several occasions I've picked up pieces of the lead-silver ores from the Silverton District, Colorado. Outwardly they show very little. The galena and sphalerite, which make up the bulk of the specimens, are dull, the quartz is dirty, and whatever silver shows on the surface is blackened. But inside—wow! Every cavity in the quartz or between the quartz and the ore minerals has something to delight the eye. From the apparently unpromising material I've made about 100 mounts of silver, pyrargyrite, proustite, stephanite, argentite, polybasite, embolite, galena, sphalerite and several that I haven't yet identified. Had enough?"

We had a visit from D. Ellis Lit, of New York, Philadelphia and New England. Mr. Lit, among other things is a decorator and sculptor, and but recently became interested in microscopic mineralogy. We had a terrific evening. In addition to the mineralogy Lit was fascinated by the form and color of the mounts. You know, it gives one a big boost to be appreciated. We've spent hours and hours selecting and mounting to best advantage some of the m/ms we have. And like the schoolboy who gloats about winning the privilege of staying after school to wash the blackboards, we figuratively bust our britches every time someone who knows commends us for our stuff.

Members of the New York Mineralogical Club paid a visit to the Philadelphia Academy of Natural Sciences recently, with the members of the Philadelphia Mineral Society as hosts. It was something. Conducted tours, demonstrations, lunch, observing and handling of famous type material, famous collections, etc., all contributed to a most wonderful week end. The enthusiasm of the hosts, the open-armed welcome of the Academy's trustees and the informality of the occasion provided a memorable visit. Dinner at a famous restaurant, where we, a part time New Englander raised in the niceties of implement management when stowing a lobster aboard, were astounded to see the waitresses tying large waterproof bibs around some of the male diners! O tempora, O mores! Imagine not being able to consume a lobster without losing

a portion of the precious ambrosia. Immediately the questions posed themselves. "What goes on in our homes and institutions to-day? What has happened to fundamental and basic education and training?" What price a system that teaches correct techniques in tuning in video but neglects more important concepts of living?" Our weekend was almost ruined until we dropped in at the home of Dr. and Mrs. W. Hersey Thomas at Mt. Airy. Talk about a micromount collection! There were some of the most beautiful mounts we had ever seen. Selected specimens from famous old-time collections, new and rare modern pieces, unusual and perfect "picture crystals"—all were there and more. We spent a most enjoyable evening and hope again to visit.

Mr. Zodac, Editor of *Rocks and Minerals,* advises that the December, 1931, issue, "Wills on Preparation of Micromounts," is completely out of print. Perhaps if a great enough demand arises reprints of the article will be made. Meanwhile, we again recommend the two fine articles by Jay T. Fox. "Micro Mineral Mounts, Preparation and Mounting Technique" (Nov. 1942) and "Micro Mineral Mounts, Their Illumination and Visualization" (Dec. 1940). These are still available, but perhaps not for long. And the thought comes—"Why not a compilation of everything about micromounting that's ever been in R & M?" Anybody interested? Well, write to the editor.

EARTH-SCIENCE ESSAY CONTEST FOR JUNIORS

Another earth-science essay contest for juniors is being announced by the American Federation of Mineralogical Societies.

The interest aroused by a similar contest just concluded has encouraged the officers of the Federation to sponsor another one, which will end October 15.

This contest is open to boys and girls under 20 years of age in the United States and Canada who have not yet enrolled in a college or university. Articles on minerals, fossils, gems, geology, or any other earth science subjects are acceptable.

The awards will include mineral specimens, books, magazine subscriptions, and other prizes to be announced. Peter Zodac has offered 25 one-year subscriptions to his magazine *Rocks and Minerals* and 50 copies of his book *How to Collect Minerals.*

Prof. Frank L. Fleener of Joliet, Ill., Robert Deidrick of Oakland, Calif., and Dr. Olivia McHugh of Salt Lake City, Utah, will be the Judges.

A simple official entry blank will be sent upon request to Prof. Richard M. Pearl, Colorado College, Colorado Springs, Colo.

Officers of societies affiliated with any of the regional federations are requested to call this contest to the attention of their junior members, who are all eligible to participate and share in the many prizes.

COLLECTORS' KINKS

MINERAL DISPLAY SUGGESTIONS

May I urge that you pass on to the readers the suggestion that they use a diamond saw to trim their more choice specimens? Many times in the past years I have had specimens on display which looked good when viewed from the proper angle. The trouble with many specimens is usually that they cannot be made to set so that the choice crystals will catch the eye first. I have found that by cutting a base they will become superb specimens instead of ordinary ones. Sawing is far superior to using a chisel. It saves the crystals, too!

Cal O. Gettings,
Toledo, Ohio

BIBLIOGRAPHICAL NOTES

Jewelry, Gem Cutting and Metalcraft: By William T. Baxter.

The 3rd edition (revised and enlarged) of this very fascinating book has just made its appearance. That the book fills a most vital and important need in the lapidary field it need only be mentioned that it made its first appearance in 1938. This first edition had 4 printings. The second edition out in 1942 had 12 printings; this new edition makes the 17th printing.

The author has long been recognized as one of America's leading amateur gem cutters and metalcraftmen. He is, furthermore, instructor in jewelry and gem cutting at the Woodrow Wilson High School, Washington, D. C., and so he combines his teaching qualities with his personal experiences with gems and minerals in preparing his most interesting and instructive book.

The book contains 334 pages, 231 figures, is 5¾ x 8¼ inches in size, and sells at $4.00 a copy.

Published by McGraw-Hill Book Co., Inc., 330 W. 42nd Street, New York 18, N. Y.

Introduction to Theoretical Igneous Petrology: By Ernest E. Wahlstrom.

The main purpose of this new book is an attempt to bring together between the covers of a small volume the basic facts and ideas of modern igneous petrology in a form that can be comprehended by the average student of geology. Brief pointed summaries of modern thought and of classic papers in the field of theoretical igneous petrology and explanation of the theory of petrology are some of the important features of the book.

Dr. Wahlstrom, a consulting geologist as well as profęssor of geology at the University of Colorado, has had a wide-spread experience in the mountainous (igneous) areas of Colorado. He has, in addition, carried on extensive research in petrology.

The book contains 365 pages, a large number of line drawings and explanations, is 5½ x 8½ inches in size, and sells at $6.00 a copy.

Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

Geology and Economics of New Mexico Iron-Ore Deposits: By V. C. Kelley.

This new bulletin is another interesting and valuable publication by the University of New Mexico. It is devoted to the extensive iron-ore deposits of New Mexico, most of which are located in the southern half of the State, the chief localities occur in Grant, Sierra, Lincoln, Socorro, and Otero Counties.

The ore minerals are magnetite, hematite, geothite, limonite, and siderite of which magnetite and hematite are the dominant ores. Associated with the ores are such minerals as arsenopyrite, calcite, chalcopyrite, cubanite, dolomite, epidote, garnet, gypsum, jarosite, malachite, pyrite, pyrrhotite, quartz, and many others.

The bulletin is illustrated with many plates and figures while a frontispiece in color (magnetite ore and gangue minerals from the Fierro district) is an attractive feature.

The bulletin is 6 x 9 in size, contains 246 pages, and sells for $3.00.

Published by the University of New Mexico, Albuquerque, N. Mex.

Report of the Committee on the Measurement of Geologic Time, 1948-1949: John Putnam Marble, Chairman.

Presented in preliminary form as Appendix 4 at the Annual Meeting of the Division of Geology and Geography, National Research Council, April 23, 1949.

The report contains an annotated bibliography of selected articles dealing with the measurement of geologic time, and supplementary reports on the works of various authors. Contains 149 pages. Price $1.00.

Issued by the National Research Council, 2101 Constitution Ave., Washington 25, D. C.

NO TREMOLITE AT LOCKPORT, N. Y.

Quite a number of inquiries have been received by *Rocks and Minerals* relative to tremolite of Lockport, N. Y.

Tremolite does not occur at Lockport, nor, as far as we know, at any spot in western New York.

Good tremolite is found in St. Lawrence County, especially at Fowler where the pink variety (hexagonite) is found. Fowler is in the northern part of New York, Lockport in the western part.

A good article on Lockport minerals appeared in the May, 1943, issue of *Rocks and Minerals*. "The Pekin quarry at Lockport, N. Y.," by Paul E. Killinger, pp. 136-137.

"WONDER MINERAL" OPENS NEW CONSTRUCTION HORIZONS

Home and buildings of the future will provide greater safety and comfort for their occupants and greater freedom and flexibility for the architectural designer through use of a "wonder mineral" which has reached its peak development in the past half-century.

That was the statement made by Andrew T. Kearney, president of the Zonolite Company of Chicago, in a mid-century report issued by the organization, world's leading miner and processor of vermiculite, a mineral of the mica family which has revolutionized the construction industry because of its unique characteristics.

Used in place of sand or gravel in the mixing of plaster and concrete, vermiculite's value to the construction industry, according to Kearney, stems from the fact that it possesses the unusual property of expanding up to fifteen times its volume when subjected to high heat during processing. The expansion renders the material featherlight—less than ten per cent the weight of sand or gravel—and fireproof—it will not burn under any circumstances.

These properties, Kearney points out, have provided architects and contractors with a material which allows construction flexibility hitherto thought impossible. Its lightness makes it possible to add extra stories and wings to structures which couldn't support these additions if sand and gravel were used. Its lightness reduces the weight of large buildings by millions of pounds, thus permitting huge savings in structural steel supports.

The gold prospectors at the turn of the century made a most significant, yet unwitting contribution to the construction field in their discovery of a mineral which they termed "fool's gold." In their search for gold and other precious minerals, the prospectors found a huge deposit of vermiculite in Libby, Montana. Attracted by its golden glisten when expanded by heat, and dismayed when it caved in whenever they dug holes in it, the prospectors, the report said, didn't realize that what they had discovered was slated to become one of the foremost construction developments of the first half of the century.

Vermiculite made its industrial debut about a quarter of a century ago when the Zonolite Company was estiblashed to develop the Libby deposit. But the mineral didn't achieve its fame until contractors realized the value of its unique insulating properties for heavy construction jobs. By using vermiculite plaster instead of solid concrete for fireproofing the steel skeletons that support modern buildings, engineers discovered that they could slash the weight of buildings immeasurably. For example, when the new 35-story Mercantile National Bank building in Dallas, Texas, was completed, using vermiculite to fireproof the structural steel members, it was found that its weight had been reduced by 31,268,653 pounds—30 per cent of the building's weight!

Mr. Bales Lectures on Gem Stones

C. E. Bales, president of The Ironton (Ohio) Fire Brick Company, gave a lecture on "The Chemistry of Gem Stones" before the Central Ohio Valley Section of the American Chemical Society. The meeting was held in Huntington, West Virginia, on April 13.

Appreciates Assistance!

Editor R & M:

Enclosed are the last publicity items I will send to you. I am aware that your deadline for June is past. One of the problems of this job is getting material in time for deadlines. If you can get it in the June issue—that will be fine.

I do appreciate very much the assistance you have given. Many thanks.

I am looking forward to seeing you at the convention.

Herbert F. Grand-Girard

April 25, 1950 Evanston, Ill.

COLLECTORS' COLUMN

Conducted by A. CAL LECTOR

This column, which began with the Sept.-Oct., 1948 issue, is of special interest to beginners in mineralogy as we comment briefly on one or more of the common minerals. In the last issue we talked on calcite. This time we will take up celestite, another common mineral.

Celestite

Celestite is strontium sulphate. It is a heavy mineral which generally possesses a faint blue tinge but may be white, yellow, green, or reddish. It is transparent to translucent. The early minerals found had a sky blue color and thus celestite received its name from celestial (pertaining to the sky or heaven).

Celestite is a common mineral at some localities but unfortunately there are not too many localities for it in the world. It was first found (over 150 years ago) in limestone outcropping along the Little Juniata River in what was formerly known as Bells Mills which was once a part of Huntingdon County in Pennsylvania. Bells Mills is now Bellwood in Blair County. This Pennsylvania locality has been rediscovered and an article on it may appear shortly in *Rocks and Minerals*.

In Ohio are found beautiful celestite crystals of a bluish tint which are considered by many collectors to be the finest known in the world. Strontian Island (also known as Green Island) in Lake Erie (Ottawa Co., Ohio) used to produce the largest and finest crystals known; for the past number of years the large limestone quarry at Clay Center, Ottawa Co., Ohio, has been producing excellent crystals, chiefly of a bluish tint—these may be crystallized but often occur loose, flat, and in a form resembling an arrowhead.

Some noteworthy foreign localities for beautiful celestite crystals are Yate, Gloucestershire, England, where geodes, lined with large colorless transparent crystals of celestite, are found in marl; the copper mines at Herrengrund, Hungary, produce blue celestites; and the sulphur mines at Girgenti, Island of Sicily, Italy, where splendid groups of colorless celestite occur with sulphur and gypsum.

Every mineral collection should have one or more beautiful celestites on display. Your favorite dealer can supply the mineral. The next time you send him an order—be sure that celestite is on the list!

GETTINGS FEATURED IN TOLEDO PAPER

Cal O. Gettings, 2001 Starr Ave., Toledo 5, Ohio, is one of Ohio's most active mineral collectors. He is also one of the foremost amateur gem cutters of the country and his lapidary skill is known far and wide. Recently the *Toledo Blade* not only featured Mr. Gettings and part of his fine collection but also bestowed on him the title "Master of Gemology."

In the Pictorial Section of the *Toledo Blade* (Sun. Feb. 26, 1950) appeared a nice write-up on Mr. Gettings together with 6 large illustrations. In addition to this, the entire front page was a beautiful photo, in color, of 39 mineral specimens, polished slabs and cabochons—some of Mr. Gettings prized possessions. As the page is 10 x 15 inches in size, the illustrations were unusually large and also well made. Then on page 6, the front cover was reproduced in black and white (reduced to 5 x 7¼) with each item numbered; alongside was a key listing the names and places of origin for the minerals (No. 1 was fluorite from Rosiclare, Ill.—and No. 39 was petrified wood from Arizona). Minerals are most difficult to reproduce in color but the colored front page mentioned above was an unusually fine piece of work and the *Toledo Blade* is to be commended for it.

CLUB AND SOCIETY NOTES

ATTENTION SECRETARIES—If you want your reports to appear in the July-August issue, they must reach us by June 20th—the Editor.

Queens Mineral Society

The Society held its regular meeting on February 2, 1950, at the Church of the Resurrection, Richmond Hill, New York.

The Program Committee presented its plannings for the future meetings of the club, with the suggestion that something of a club discussion or "workshop" program be included in the regular addresses and lectures. The Committee suggested that these "workshops" take the form of inter-club discussions on various phases of mineralogy and geology such as Specific Gravity, Hardness, Mineral Identification by Sight and Chemical Analysis, and some of the other elementary stages of mineral identification. This proposal was met with the approval of the club and will be carried out in the very near future.

The speaker of the evening was Mr. Daniel Black, a club member, who addressed the club on "The Zeolites, Their Structure and Occurrence." He pointed out that x-ray investigation has brought out entirely new interpretations regarding the complex lattice-structure of the zeolites, and explained in detail the tetrahedral unit-cell structure of the group and the various complex silicate chains make up their structure.

Mr. Black pointed out further that the three-dimensional crystal lattice of the zeolites was the cause of the ready base-exchange and continuous dehydration phenomena which characterize this group, and also explained these peculiarities in detail. He then discussed the geologic conditions under which the zeolites are formed, the paragenesis of the minerals and their respective compositions, and finally a brief outline of the isomorphous groups which composed the family.

The address was concluded with a general roundtable discussion of the many zeolites which the club members brought for display. Particular attention was focused on those submitted by Mr. Maynard, a member of long-standing in the club. He displayed choice specimens of Phillipsite, Chabazite, Epidesmine, Apophyllite, Stilbite, and many others.

March Meeting

The meeting was the Club's first workshop program and was devoted to the subject of specific gravity. Club members Mr. Segler and Mr. Schneider explained the Beam Balance and Mr. White the Jolly Balance.

Mr. Segler opened his discussion with a test for determining specific gravity by heft. In conducting this test, nine minerals of grading weights were used as a scale, and members were called upon to decide the gravity of unknown minerals by comparing with the scale. He then assembled a wooden Beam Balance which he had constructed at a cost of 25c, using hairpins, nails, etc. for weights, and proceeded to demonstrate the accuracy of this home-made Balance.

Mr. Schneider exhibited a Beam Balance which he had made of metal. The advantages of many fine details and attachments on this balance, one being the arrangement for the changing of the center of gravity was brought to the attention of the group.

Mr. White explained the mechanics of the Jolly Balance and demonstrated on one which he had built. A very interesting idea was introduced by Mr. White, wherein a hydrometer might be used for taking specific gravities of solids if a few attachments were made.

A lively question and answer period followed the discussion with everyone agreed upon the success of this new type program.

Georgina Lemon, Secretary
49 W. 11th Street
New York, N. Y.

Yavapai Gem and Mineral Society

Ernest E. Michael, president of the Yavapai Gem and Mineral Society, spoke on "The Cutting and Polishing of Gem Stones" at the Society's monthly meeting held in St. Luke's parish house, Prescott, Arizona, Tuesday evening, March 7. Prior to the meeting an enjoyable potluck supper was held, for which the arrangements were made by Mrs. Durward G. Caldwell and Miss Jeanne Stolte.

President Michael, who has an outstanding collection of gem stones, one of the finest in the state, explained the details of cutting and polishing, encouraging beginners to take up a branch of rock study that possesses great fascination and leads to very satisfying results. He brought with him examples of stones in the rough and the polished product worked on his own machine. He named turquoise and petrified wood as easiest for the amateur. The opal, he said, is one of the hardest.

Stones exhibited included zircon (his "pride and joy"), California Jasper, Arizona jasper, Montana fern agate, flowering obsidian, malachite, synthetic rubies and Sweetwater, Wyoming agate.

Mr. and Mrs. H. G. Porter furnished the door and quiz prizes, which were won by Mrs. Cora Mae Hall and Paddy Shire (door) and Mrs. Irene Lingamfelter and Gary Purviance (quiz).

Harold Butcher
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Prescott, Arizona

Mid-Coast Mineral Club

The Mid-Coast Mineral Club of Southern San Luis Obispo County, met at the Pacific Museum, Shell Beach, Calif., for its regular bi-monthly meeting on March 24th. Following the regular business session our program included some fine colored projection pictures taken by the Welder Jones's on a 7,000 mile trip which took in the territory from Texas to northwestern Alaska and return. The Alcan Highway was a revelation to our members and a very real understanding of that primitive country was gained by all present. The rugged grandeur of the Yukon and Alaska was beautifully displayed while Mr. Jones humorously told of the inconveniences of that undeveloped country. We also enjoyed pictures of the Death Valley Pageant and other western views. Any club that can view these fine travel series as shown by Mr. Jones will have a wonderful treat in store.

Regular business included action on a project to install signs along the major highways of the County pointing out the natural scenic attractions.

Officers are H. Douglas Brown, President; Cleon Kite, Vice-President; John Barden, Vice-President; Hugh Westfall, Treasurer; and Constance M. Groth, Secretary.

Constance M. Groth, Sec'y.
487 Santa Rosa Street
San Luis Obispo, Calif.

Feather River Gem and Mineral Society

Annual Picnic and Mineral Show of the Feather River Gem & Mineral Society, Inc., of Oroville, Calif., will be held on June 4, 1950, on the Club grounds, 5th and Shasta Streets, in Thermalito (just outside Oroville). Rockhounds and pebble pups are urged to attend. A potluck lunch will be served at 1 p.m., as has been the practice in preceding years.

Mrs. George Foster will be official hostess, and Lee Reeves is arranging a photographic exhibit in cooperation with the Feather River Camera Club.

If the Club building is not ready for housing of exhibits by the time of the show, it will be an out-of-door affair, the same as the California State Federation Convention.

Through the services of Orlin J. Bell, former president of the State Federation, the Club became incorporated in March, 1950. Officers of the new corporation are those elected in December: President, Don Parker; 1st Vice-President, John Gemsky; 2nd Vice-President, Douglas Ward; recording secretary, Mrs. Iva Foster; treasurer, George Foster; Directors, F. E. Rankin, V. J. Rasmussen, and Oliver Freestone.

The Club is now meeting at 8 p.m., on 2nd and 4th Fridays, at the Elementary school in Thermalito. Visitors are welcome, as always.

Among the interesting programs which have been held in the last few months are: demonstration of working of gemstones on Club Gemmaker by Nathan Bolin; a talk on "An Amateur's Approach to Archeology" by Mrs. C. E. Snyder (this will be broadcast on a service club luncheon program over local radio station KDAN, date and time not yet available); and showing of kodachromes and mineral slides by Oliver Clough, our own member and president of the newly formed Paradise Gem and Mineral Club.

Adeline Rankin, Cor. Sec.
Feather River Gem & Mineral Soc., Inc.
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Chicago Rocks and Minerals Society

Dr. J. R. Hudson of Dayton, Ohio, complimented the Chicago Rocks and Minerals Society by making a flying trip, via air lines, to lecture on "Faceting." The surprise treat occurred upon the Society's Fourth Annual Birthday Party, held February 11th at our regular meeting place, Green Briar Field House, 2650 W. Peterson Ave., Chicago, Ill.

Dr. Hudson, a man of jovial disposition very expertly discussed his subject on faceting, and the Society as a whole profited greatly from the knowledge he imparted to them. An additional touch to further inspire his listeners, was the privilege of handling pieces of the rough faceting material, and the final awakening and realization of the skillful technique used in faceting upon viewing the results which Dr. Hudson displayed for all to see. An excellent collection of brilliant and sparkling faceted stones.

Accompanying the noteworthy collection of Dr. Hudson's gems was a representative exhibit of Opals from all parts of the world. The exhibitor, a recent member, Mr. Roy Olson, included cabochons, carvings, and opals mounted in rings and tie pins. The most puzzling gem of the collection was a tie pin holding an inverted clear jelly tear, the core of which represented a pole from which tiny flags seemingly extended, each a different color as the stone is turned.

At the same meeting, Mr. Joseph W. Kozisek, a student mineralogist interested in mining, gave an enlightening demonstration on the use of a small and inexpensive field kit, pocket size, that he uses to determine the specific gravity and hardness of field specimens. The kit comprises a small mineral dictionary, a small spring suspension type gram scale, a bottle to hold water and both dark and light pieces of abrasive paper used to determine both scratch and color streak tests. Mr. Kozisek's method, elimination, though quite simple is adequate enough for the field rockhound prospector.

Birthday cake and plenty of hot coffee rounded out the evening.

Helen L. Cooke, Pub. Chm.
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Chicago 41, Ill.

Mineralogical Society of So. California

The Mineralogical Society of Southern California held its regular February meeting on the second Tuesday, February 14th instead of the second Monday as the Pasadena Public Library was closed on Monday because of St. Valentine's day.

Professor Edwin Van Amringe, one of our Charter Members, and instrumental in founding the Society, brought as our guests his class in Geology for the Layman, and our hall was filled to overflowing, as is so often the case when we have an unusually good program, and this is often.

Two good films were shown: "Nevada Minerals" by U. S. Bureau of Mines, and "Man-made Canyons" by U. S. Dept. of Interior. I am sure everyone found them interesting, by the breath-taking silence that prevailed, and the earnest conversation that took place among the members at the close of the meeting.

Nevada is a wonderful state containing over 100,000 sq. miles of cactus and sage brush, with 6% under cultivation, and 10 inches of rainfall annually, not to mention 320 bright sunshiny days per year. Its history is replete with accomplishment, particularly in early day mining. Remember the great Comstock silver lode and its untold wealth; also the Wonder City of the century—Goldfield and its tales of enormous wealth. A friend of mine, Herbert Fritts, now of Boulder City, Nevada, was there and some day I'll tell you some of the wild tales he has told me, of the early day struggles for gold and wealth and power, murder and bloodshed, which too often follows wealth.

Its great mineral wealth, gold, silver, lead, zinc, copper, diatomite, gypsum, perlite, turquois, fluorspar, aluminum, manganese, magnetite, magnesite, scheelite, wolframite, silica sand, brucite, kaolinite, and many others too numerous to mention, have made it one of the wealthiest mining states in the Union. The great Ruth Mine produces 18,000 tons of copper daily and is one of the largest open pit mines in the U. S. A. I believe it is second only to the great Bingham Canyon pit near Salt Lake City, Utah.

This great State boasts of many of the beauties of nature: natural bridges, awe inspiring canyons, beautiful streams and mountains. Lake Tahoe with its indigo blue and turquoise waters fills the nitch high in the mountains carved out by the glaciers of the last ice age and in its limpid depths are reflected verdant and rock strewn peaks which surround it. Lucky is the tourist who walks upon its shores and gazes breathlessly into its limpid entrancing depths. The soft tranquillity of its magnificence lifts one's soul high above the hum-drum of every day life and transports his being into a fairyland of delight. Don't take my word for it—go there and see for yourself.

Lake Meade, behind the Great Boulder Dam, one of the best spots for boating and fishing, is the largest man-made lake in the world, and provides water and electric power for the entire southland, including the metropolitan area of Los Angeles. Hunting, too, is one of the choice offerings to the nimrod fortunate enough to be able to vacation in this the 6th largest State in the Union with the smallest population. Deer, wild duck and geese, together with other wild fowl and game, although I prefer to shoot mine with a camera.

Las Vegas, the last colorful frontier town, holds promise of amusement to those who like the roulette wheel and the one-armed bandits, black-jack, and poker, although don't get the wrong impression; these people are jealous of the good name of their town and an ever alert police and sheriff's force of law-enforcement officers keep the streets free of drunks and rowdies—in fact it has often been stated that there are more drunks in one large city block of our metropolitan cities than can be found in the whole State of Nevada. Rodeos and out-door amusement activities provide plenty of entertainment for the Tenderfoot and his lady friend. Don't be afraid; come and visit the last Frontier town and I promise you nothing will happen to mar your enjoyment. It is colorful alright, but sensible and civilized.

The second picture: "Man-made Canyons" by the U. S. Dept. of Interior was a picture exhibition of the great International Nickel Corporation's Open Pit mine in Ontario, Canada, where 40 million tons of ore have been excavated. One blast at this great pit required 4,200 lbs of dynamite and 11,400 lbs of black powder, 360 miles of copper wire to set off the blast which blew out 31,000 tons of rock, 2/3 of which was ore. Seven Steam-shovels with 7½ yard dippers put 32,000 tons through the crusher in one 24 hour day. This pit has never been idle but one day when a snow blockade prevented the men from getting to the pit. They often work in from 30 to 40 degrees below zero temperatures. It operates 24 hours a day the year around. Time and space prevents further elaboration. Some day I'll write you some stories about Goldfield—I hope.

John A. Quinn
Publicity Chairman
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New Lapidary Club Organized in Chicago

A new lapidary club has been organized in Chicago by Mr. John Stefans. The officers are Jack Best, President; Harold S. Hill, Vice-President; Adeline Geary, Secretary; and John Stefans, Treasurer. Anyone interested in joining the Club may obtain full particulars by contacting the Treasurer, Mr. John Stefans, 6613 S. Richmond St., Chicago 29, Ill.

Pacific Mineral Society

Pacific Mineral Society enters a new year. President H. E. Eales turned the gavel over to new president, J. A. Jones, at the February meeting held at 3716 Wilshire Blvd., on the 17th. R. M. Glenn as 1st vice-president and R. H. Cooley, 2nd vice-president. Lillian Allard with a twinkle in her eye, welcomed Ruth L. Kuehne as the new secretary. W. E. Clarke will be treasurer this year while R. J. Wilson will lead us on many enjoyable field trips. Rev. J. C. Weston will be with the board of directors.

During the annual reports it was revealed that we had 108 guests during the year. The average attendance at meetings was about 50 and we are entering the new year with 97 members.

Some highlights on the programs that were enjoyed during the year. Our first speaker was our own O. C. Smith with his humorous talk on early day gold mining to start the '49er year off with a bang. In March Kenneth E. Stager took us on an imaginary trip to Burma with his colored slides. In April we were with William R. Harriman in the Mother Lode Country, then with Col. Clarence M. Jenni in May to North China. Dr. John Herman took us "Prospecting for Minerals by Plant and Animal Life" in June. At least once during the year we MUST have a talk by Victor M. Arciniega, former president and instructor to most of us in earth sciences, he spoke on copper deposits of Arizona, in July. Victor J. Hayek in August told us all about "Mining Law" in the early days, then in September Dr. Joseph Murdoch with colored slides gave us the inside story of the "Pegmatites of Brazil and Scandinavia."

Again in October we were in Europe with Dr. Ian Campbell who attended the International Geological Congress. Dr. Richard Jahns explained about granite bursts with slides, then for December "Santa Claus" was the main attraction, and in January John M. Akers brought us back to more serious thought by colored slides about "Mining in Peru."

R. J. Wilson our field trip planner brought back some pleasant memories about trips taken during the past year. In February to nearby Palos Verdes, then for March all the way to Quartzite, Arizona, and to Rincon in April for two days with nite collecting of blue apatite. Before the weather had a chance to get too warm, May found us in Goodsprings, Nevada, that collectors heaven. June was THE FIELD TRIP when 42 of our members were at Sacramento to bring home the placque for the second time, we sure want our name on there next time if possible so it will be ours for keeps. Grapevine has it that our Society had the largest representation of all visiting societies. July found us seeking higher elevations so off to the Santa Rosa Mountains. For August an old fashioned picnic and display was enjoyed at the home of Mr. and Mrs. O. C. Smith. Up to Malibu and Spiney Ridge mountains for September then for October to Western Trails Museum in Huntington Beach. Advantage was taken of three days over New Year's by a delightful trip to Death Valley.

Dr. P. A. Foster gave a short talk on the history of crystallography and had on display crystals from his collection and many books he was able to obtain while in London last year. One book was written about two thousand years ago in Latin-Greek 315 years B. C, it was published again in 1667. The early grouping of earth studies was metals, stones and earths and it was believed that crystals were formed by freezing until in 1673.

Six hundred gem stones were known in 1678. The first mineral book published in English was in 1702. The "father of crystallography" was Abbé Haüy who accidentally discovered crystal formation by dropping the specimen of calcite owned by a friend and each piece was broken with the same crystal formation. He took the small pieces and experimented by breaking them further. He was from a poor family and not strong as a young man as he was rejected from Napolian's army. With much hardship he was able to attend college and further study crystals and compiled all his information into book form. In 1880, 1810 and 1830 books were printed in Swedish, French and German. From that early study, the present day groupings of crystals into six groups of Isometric, Hexagonal, Tetragonal, Orthorhombic, Monoclinic and Triclinic systems have all been classified.

Miss Saylor Describes Colorado River Trip

Pacific Mineral Society celebrated the birthday of St. Patrick, the Patron Saint of all miners, March 17th, with appropriate table decorations including a blarney stone and favors for all present.

The program presented by Miss Pauline Saylor is one that can be enjoyed over and over again, being an interesting speaker she lets you enjoy the trip down the Colorado River the easy way with colored slides and motion pictures.

After preliminary trials in adjusting to life in a small boat in the more quiet waters of the San Juan and Salmon rivers the twelve members were ready to start the 240 mile trip down the mighty Colorado in four small boats built especially for the rough waters encountered during the three weeks of sailing from Lee's Ferry, Northern Arizona, just above the Navajo bridge which is 467 feet above the river. The elevation at the start was 3,000 feet and the temperature 86 degrees. During the trip the temperature encountered was from 102 to 130 degrees and no shade most of the time. The Colorado has the longest rapids in North America, the water breaking over the rocks forms waves as much as ten feet high.

Some of the interesting highlights of the trip were the artifacts of early Indians found along the sandbanks and the grain storage caves high on the sheer faces of the steep cliffs. At one stopping spot the cherry trees were full of fruit, to the delight of the passengers.

The method of running the rapids was for the oarsman to stand up and the passengers would lie across either end of the boat with toes tucked under ropes fastened to the boat and the hands gripping the ropes on the other side of the boat.

The first portion of the trip is thru Six Mile Canyon then entering Marble Canyon with walls of limestone, then the gorge of the Grand Canyon. At one place the river drops 20 feet in elevation in a distance of 300 feet.

At the junction where the Little Colorado empties its clear blue water into the muddy Colorado the party enjoyed swimming. Most of the way down, the steep cliffs made it impossible to leave the canyon, the river being the only way out. Some of the walls of hard gray-black rock with basalt appeared to have been polished.

One disappointment of the trip from the rockhounds point of view was that though many minerals were found there was no place to store them to bring them out. Much agate, jasper, banded onyx, carnelian and chalcedony and then the beautiful stalactites of calcite and copper found in a mine tunnel.

The river has cut its channel so deeply that the strata of the oldest rocks are visible also ancient volcanic lava flows may be found.

Names that the average traveler will never encounter but familiar to all who have made the river trip are Vasey's Paradise, named after a botanist in 1869, Grapevine, Hance and Sockdolager rapids and Nancoweep. At one place the heat on the river was so intense, the party pulled up on a sandbank into a cave, the river had washed from the bank. The mouth of the cave was about 500 feet across and the ceiling about a 150 feet high.

The water of the Colorado was "too thin to plow and too thick to drink' but some of the time that was the only water available for drinking.

At some of the most dangerous rapids the passengers walked around while the boats were taken bobbing down the rough water, they made the trip in about 1½ minutes while it took the passengers three-quarters of an hour to walk the same distance. The movie film showed the rapids from the passengers' viewpoint and also from the bank as the small boats went swiftly by.

At one place the shade was shared with a three-foot rattlesnake the members found out that it is impossible for a snake to strike while being held by its tail by someone brave enough to get that close.

After entering the bounderies of the Grand Canyon National Park a large bonfire was built as a signal to watchers on the south rim that all was well and the party progressing according to schedule.

A Blue Heron adopted the party as a mascot from Lava Canyon to Lake Mead, it would fly ahead and then when the party came around the bend it would start on again leading the way.

The suspension bridge across the Colorado at Bright Angel Creek was a welcome sight and the members enjoyed a stay at the Phantom Ranch. Miss Saylor packed out of the canyon and some of the passengers stayed with the boats and went on to Lake Mead.

Myrtle Musselman
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Whittier Gem and Mineral Society

The Whittier Gem and Mineral Society is looking ahead to an active and enjoyable year under the leadership of recently installed President, Bill McIninch; Vice-President, Ed Kantor; Secretary, Mrs. P. C. Hutcheson; and Treasurer, Alfred J. Styerwalt.

The Club has voted to join the Federation and take part in convention exhibits.

Mr. John A. Tubbs, Field Trip Chairman, has lined up a schedule of regular trips, under the leadership of Mr. Darold J. Henry. A caravan of cars took a four day trip to Colorado during the Easter vacation period.

Mrs. O. Howard Lucy, Pub. Chm.
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Whittier, Calif.

Searles Lake and N.O.T.S. Societies Scout Field Trips

Both Searles Lake Gem and Mineral Society and N.O.T.S. Rockhounds are scouting various collecting localities in preparation for the 1950 Convention of the California Federation to be held near Trona, Calif., June 17 and 18, 1950. The clubs have planned many of their own field trips to scout and map areas that will be available to convention visitors.

Sunday, February 19 the N.O.T.S. group traveled the full length of Last Chance Canyon in the El Paso Mts., and scouted and mapped localities for agate, jasper, petrified palm and fig and a new locality where an unusual occurrence of chalcedony coated calcite crystals and casts have been found.

Searles Lake went into the Blue Chalcedony-Lead Pipe Springs area February 25 and 26 to work the geode and nodule deposits. At the same time members cleaned up the overburden above the opal deposits so there would be no danger of a cave-in when visitors work the seam.

These are just two of the field trips that are planned for the convention. The two clubs, together with the Mojave Desert Mineralogical Society of Boron, plan to scout eight or ten other localities and have them available and in good shape for the big meeting in June.

Mineralogical Society of Arizona

Clarence A. Reiger of Phoenix, district technician for the Mt. States Tel. and Tel. Co., presented the motion picture "Crystal Clear" at the January 20 meeting of the Mineralogical Society of Arizona.

The process of growing "artificial" EDT (ethylenediamine tartrate) crystals in solution was described in technicolor. The crystals, however, are actually produced by the elements in the solution. Wafers sliced from the crystals are used as "traffic guides" in directing telephone conversations. Research work and production of them for the telephone company is done by Western Electric.

EDT crystals can be grown under artificial conditions in approximately three months, while those grown by nature sometimes take two thousand years. The EDT seed crystals are grown on a stainless steel rod in the solution. From the terminated caps of these the larger crystals are produced.

The difference between the artificially grown crystals and those produced by nature was explained later by Arthur L. Flagg, president of the society.

On January 22, forty members and guests enjoyed a pot-luck lunch at Desert Botanical Garden. A lecture by Dr. W. Taylor Marshall, director of the garden, was given on the possibility of relationship between the color of cacti blossoms and the type of soil in which they grow. The lecture was illustrated with kodachromes. Members were invited to cooperate in a project to observe and report on variations of color on blossoms of the species shown.

February 3. Announcement was made by president Arthur L. Flagg that due to the illness of Prof. Paul Miller of Arizona State College, his lecture on crystallography would be postponed until a later date.

On the improvised program Mr. Flagg gave a talk on birthstones and important localities where they are found. He stated that birthstones originated among the early Egyptians. The earliest written record of them was made by the Jews in the Holy Land.

In speaking of Arizona's mineral resources he said that since 1877 (when records were begun) it has been valued at more than 5 billion. This included the interesting figures of 11,884,360 tons of copper and 11,887,029 ounces of gold.

Floyd Getsinger, Phoenix, gave a fine talk on the Grand Canyon, illustrated with kodachromes.

The Mineralogical Society of Arizona held a rock auction on February 17. Milford Benham, teacher of geology and physics at Phoenix College, was auctioneer. Ed Powell, mining engineer, Ajo, Arizona, described minerals found at the open-pit mine there.

February 5. Forty members visited the Woodpecker Mine under the guidance of Lee Boyer, part owner; and near-by Ajax Mine upon invitation of Robert Dannally, in charge. Specimens found were horn silver, amethyst, sphalerite and galena.

February 19. Field trip to Pinnacle Peak with 30 rockhounds and herptologists headed by Jim Blakely. Results: White and rose quartz and a box of rattlesnakes.

March 3. Dr. Paul T. Miller, Arizona State College, Tempe, gave an illustrated talk on crystallography. Early mathematicians, he said, had accurately figured out the internal structures of crystal forms, which in 1897 were proven by X-rays. He said one could not study a dodecahedron and observe how it always comes out right without having a great deal of respect for the original Architect. Describing the mechanism of an atom with its revolving electrons, he explained that our world is not "material" at all in the sense that we have thought. And that atoms adhere to definite plans in their forming of the multitudes of crystal patterns.

March 6. Tom Tarbox, of Phoenix, Arizona's most popular columnist, interviewed members of the MSOA and wrote a super fine column about rockhounds and their "strange and beautiful rocks." Looking through the eye glass at a staurolite crystal he said "It's almost human!" His column was headed "Life of Rockhounds Not at All Hard." But he has never been on a field trip, lugging huge bags of rocks on his back and catching rattlesnakes with a forked stick.

Mr. Tarbox writes a daily human-interest column for Arizona Republic.

Arthur Damman, curator of reptiles and poisonous animals, Arizona State College, Tempe, was guest speaker at the March 17 meeting of the Mineralogical Society of Arizona. The main object of his lecture was to give outdoor people knowledge for self protection.

Out of 3000 varieties of reptiles there are 300 in the United States. Only about one fifth of the 3000 are poisonous. They are classed as non-poisonous, partly poisonous, violently poisonous. In the 3rd group are the vipers (rattlesnakes, copper heads, moccasins, etc.). In the 2nd group, the coral snake. The markings of the coral snake are bands of yellow, black, yellow.

The reptile's principal value is in controlling rodents.

By using small balloons Mr. Damman illustrated how rattlers strike. The cobra, however, would not show off but bunted the balloon with his nose. The python exhibited was quite harmless. The gila monster, only poisonous lizard known in the world, must bite and chew to inject poison.

April 7. Fred McDonald presented a program by the junior members. Maryanna Weber described minerals of primitive people. George Lambert outlined primary ore zones. Gordon

Levine discussed gold. Joyce Krause talked about gastroliths. John Peck demonstrated three kinds of field tests, chemical, blowpipe and bead. Bill Sullivan and Bob Sayers, flame tests.

A letter was read from ten year old Antonie Kallis, who at one time was the youngest member of the society. When 4 years old she knew 60 minerals and astonished mineral collectors in Colorado with her knowledge. Antonie studied minerals for two years while in bed with rheumatic fever.

March field trips were to Canyon Lake for chalcedony and geodes, and with the Tucson society to the new, open pit copper mine of the Phelps-Dodge Corp., at Ajo, Ariz.

Meetings of the Society are held on the 1st and 3rd Fridays of each month at 8 p.m. in the Assembly Hall, 1738 W. Van Buren, Phoenix. Out of state vacationers are cordially invited to attend, along with local visitors.

Ida Smith, Pub. Chm.
2010 W. Jefferson
Phoenix, Ariz.

Pomona Valley Mineral Club

At the April meeting of the Pomona Valley Mineral Club, Miss Leah Hammond showed an exceedingly interesting sound movie depicting the methods and devices used by early miners to obtain gold from placer deposits. This was a timely treat as the club members are planning a gold hunting expedition to the San Gabriel placer deposits sometime in May.

At the annual election of officers the following members were chosen to serve their club during the 1950-1951 term. Pres. B. W. Cohoon; Vice Pres. Robert Busch; Secretary, Marion Hillen; Treasurer, Alice Cohoon; Director, Heber Clewett.

Pomona Valley Club members are enjoying their practice of visiting a different member's home each month on "Open House" afternoon. This has developed into a regular club activity and is looked forward to each month with considerable pleasure. "Open House" in May will be a joint operation undertaken by the Cohoons and Krogers and will be held at the Cohoon home on May 21st.

Alice Cohoon, Secretary
246 W. Aliso Street
Pomona, Calif.

South Bay Lapidary Society

New officers have just been elected for the ensuing year for the South Bay Lapidary Society as follows:

President Mrs. Jane Hagar, Manhattan Beach, Calif.; Vice-President S. P. Hughes, Torrance, Calif.; Secretary Gordon T. Bailey, Inglewood, Calif.; Treasurer Perry Williams, El Segundo, Calif.

Permanent mailing address of the Society is c/o Mrs. Jane Hagar, 117 23rd St., Manhattan Beach, Calif.

Clark County Gem Collectors

Since February 2nd it is the Clark County Gem Collectors, Inc., the Las Vegas Club's members having been granted their charter as a non-profit corporation by the Secretary of State of Nevada on that date.

During January and February field trips included visits to an onyx vein near the shores of Lake Mead, exploration of the workings of an old antimony mine, and the search of the country surrounding an extinct geyser where fossils and other interesting concretions were found.

The Glendale, California, Lapidary and Gem Society and the Cedar City, Utah, Rock Club were invited on the official trip for March which was for agate and jasper at a new location near Goffs, Calif. The trip was held March 18 and 19 and was an overnight camp. A pleasant time was held by members of clubs from 3 states attending.

Some of the members of the club have volunteered to act as counsellors and are at present engaged in preparing members of the Boy Scouts for earning their mineral merit badges.

At the regular monthly business meeting, Mr. M. J. Christiansen, jeweler and the only certified gemmologist of Las Vegas, presented a well-received talk, followed by the viewing of the first group of colored mineral slides, of which the club is building a collection. Members find these slides, prepared by W. Scott Lewis, to be most entertaining and educational.

Paul O. Drury
Publicity Director,
P. O. Box 1028
Las Vegas, Nev.

The Los Angeles Lapidary Society

The March meeting of the Los Angeles Lapidary Society was highlighted by a program linking the amateur jewelry maker and the trade. Mr. Dick Ells showed different ways of Casting as the trade people do it. After showing slides for 45 minutes, and commenting on them, he then gave several demonstrations that showed the skill of a master craftsman.

The short business meeting was conducted by President Vic Gunderson. Coffee and doughnuts were served by Zella Kay and committee.

The Los Angeles Lapidary Society will have a representative exhibit in the Hobby Show, at the Shrine Convention Hall, March 24th through April 2, 1950. All arrangements are being handled by Marguerite Wilson, an unusual and beautiful exhibit is promised.

Oh yes, why should a rough piece of gem material be taxed as a luxury? Why not write and ask your Congressman or Senator.

Ted Schroder, Cor. Sec.
P. O. Box 2184, Terminal Annex
Los Angeles 54, Calif.

Santa Cruz Mineral and Gem Society

Frank J. Reynolds, owner of The Craftshop in Capitola, and former president of the Newport Beach Agate Society of Newport Beach, Oregon, was speaker at the February meeting of the Santa Cruz Mineral and Gem Society. Mr. Reynolds, now a machine designer and maker of lapidary equipment, machine crafts and metal crafts, was also a former field engineer for Diesel Engineering Company and spent sometime as their representative in foreign countries. His extensive global travels took him to every continent and into 28 different countries. After explaining the making of many different precision tools, and of his present work in developing a vibration-proof saw, and one that will saw paper-thin slabs, also vacuum dop sticks, he convinced his audience that he is thoroughly familiar with all necessary lapidary equipment and lapidary problems. However, his talk was primarily for the purpose of promoting the lapidary interest of the amateur, stressing the importance of using the best of equipment and precision tools, and enjoying this simple and safe hobby for every age.

Mrs. R. E. Campbell displayed her outstanding collection of Crestmore, Calif., minerals. This, no doubt, is one of the most complete collections from this famous quarry in Riverside County. Mr. Campbell was acting mineralogist at Crestmore prior to the last war.

A lively and successful auction, conducted by A. D. Godfrey, concluded the program and added materially to the treasury. Dr. John D. Fuller, local lapidary, has been scheduled as guest speaker for the March meeting.

March Meeting

A large attendance of members, together with guests from Oakland, San Jose and nearby communities, enjoyed a most interesting address on "Precious and Semi-Precious Stones," by Dr. John D. Fuller of Santa Cruz, at the March meeting. He reviewed the age-old interest and appreciation of gems down to the present time, illustrating with some very ancient and primitive pieces; comparing that craftsmanship with the exquisite carving of the Chinese. For contrast and association he showed with each of his faceted gems, a gem of the same family in matrix. He also showed cut stones of beautiful colors, which were synthetic, heat-treated or dyed, pointing out to the amateur collectors some of the pitfalls to be avoided in collecting. Some highly-prized collector's items of Oriental jade were: a snuff bottle with carved topaz stopper, a pendant, a "hand of Buddha" carved from white jade and other elaborately carved ornaments. Quartz crystals containing tourmaline crystal inclusions (a rare occurrence) were also displayed.

Dr. Fuller was formerly associated with the Rockefeller Foundation in the determination of crystal structure, which was one of the factors that later lead to the fascinating hobby of faceting some of the beautiful gem crystals. His trays of faceted stones represent a large number of the most precious gems. They are of dazzling beauty and reflect the skilled touch of a surgeon and artist. He has recently added another phase of artistry to his list of activities —that of carving jade.

At the conclusion of the lecture, society members were invited to the home of Mr. and Mrs. A. D. Godfrey to view their extensive collections of minerals, gems, petrified woods, marine fossils and plants. The Godfrey collection of woods alone contain over 300 species. Refreshments and good fellowship topped off a very delightful evening.

The society now has 65 members.

Edyth M. Thompson
Publicity Chairman
Soquel, Calif.

Texas Mineral Society

The February meeting of the Texas Mineral Society was held at the Baker Hotel on the second Tuesday of the month. The meeting was called to order by the president and the minutes were read and approved.

Mr. Myron Everts of Arthur A. Everts Jewelers gave a talk on precious and semi-precious stones and showed the steps in grinding rough stones into finished diamonds. Samples were passed around for inspection and general discussion.

Visitors for the evening were Mr. W. T. O'Gara from Fort Worth and Girl Scout Troop No. 34 of the L. O. Donald School, and their leader, Mrs. Ralph Ingraham, from Cockrell Hill, Dallas.

March Meeting

The meeting of the Texas Mineral Society was held on the mezzanine floor of the Baker Hotel, March 14th, 1950, at 8 p.m. The meeting was called to order by the president, Mr. Thomas Copeland. The minutes of the February meeting were read and a few additions made. They were then approved.

The topic for the evening was "Fluorescence Specimens." Many members brought specimens as well as short and long wave lights. Mr. J. D. Churchill showed his specimens under the lights then Mr. Copeland and Dr. John Scales.

Visitors for the evening were Mrs. A. J. Trube, Mrs. W. C. Judd, Mr. Bond, and Mr. Heberling. Mr. Heberling gave us a short talk on the Mineral Society of Colorado which has over 300 members. Dr. Pierrepont told us about the show which is to be held during April in Austin.

There being no further business the meeting adjourned at 9:50 P. M.

Fred Bentley, Sec'y-Treas.
5319 Alton Street
Dallas, Texas

The Cincinnati Mineral Society

The regular meeting of the Cincinnati Mineral Society was held Wednesday, March 1, 1950, at the Cincinnati Museum of Natural History. Despite very adverse weather conditions, a small blizzard and icy roads, 11 faithful members were present to participate in a very fine meeting.

Mr. Sarles, chairman of the field trip committee, promises a field trip for April. Details to be presented at March meeting.

Mr. James Gibbs, first member speaker of the evening, took over to present his talk which was "The Micas." Mr. Gibbs very ably covered generally the chief members of the mica division. Highlights of this talk were demonstrations of the percussion figure of micas. Asterism of phlogopite. Mr. Gibbs had prepared several dichroscopes using cleavage crystals of calcite to show the property of dichoism of various micas. He also prepared a novel unit for viewing the interference figure in micas. This consists of two discs of polaroid glass with very thin cleavage section of mica between them; by holding the mica and one disc stationary and revolving the other glass to proper position the interference figure is brought into view; glass must be held as close to the eye as possible. Mr. Gibbs believes this to be the first time this has been done with such simple equipment. Everyone present at that meeting is now richer in knowledge of micas, thanks to Mr. Gibbs.

Mr. Frank Atkins, second member speaker of the evening, presented a very fine, concise and informative discussion on "Pegmatites and Pegmatite Minerals." To quote briefly from this discussion as a matter of review, the following was significant.

"Pegmatites are extremely coarse-grained igneous bodies closely related genetically and in space to large masses of plutonic rocks. They are commonly found as veins or dikes traversing the granular igneous rocks or extending out from and into the surrounding country rock. Granites more frequently than any other rocks have pegmatites associated with them, consequently, unless modified by other terms, pegmatite refers to granite pegmatite. The minerals in pegmatites are those commonly found in granite-quartz, feldspar, mica, but of extremely large size. Pegmatites of greatest interest are those containing other and rarer minerals. In these pegmatites there has apparently been a definite sequence in deposition. The earliest minerals are microline and quartz, with smaller amounts of garnets, and black tourmaline. These are followed, and partly replaced by albite, lepidolite, gem tourmaline, beryl, spodumene, amblygonite, topaz, apatite, and fluorite. A host of rarer minerals such as triphyllite, columbite, tantalite, monazite, molybdenite, and uranium minerals may be present." With this brief quote it is easy to see the preparation and presentation of Mr. Atkins subject was very well done.

Our next meeting will present Mr. Carl Stephany. His subject "Iron Pyrites and Marcasite."

March Meeting

The regular meeting of the Cincinnati Mineral Society was held Wednesday, March 29, 1950, at the Cincinnati Museum of Natural History.

This meeting was very well attended, 20 members being present. Mr. Gschwind reported briefly on a two weeks business trip to Paterson, New Jersey. He spent two weekends collecting mineral specimens at the famous Franklin, N. J. area. Mr. Gschwind told of the fine folks of the North Jersey Mineral Society and Mr. Ted Schoen, an eastern dealer, who were of considerable help to him. Mr. Gschwind also presented to the Society, the Bulletin "Crystal Cavities of the New Jersey Zeolite Region," which was presented to him for the Society by Mr. Casperson, Curator of the Paterson Museum and President of the North Jersey Mineral Society. The Society wishes to thank these people for the courtesies extended to Mr. Gschwind.

Mr. Sarles of the field trip committee announced plans for a field trip to Clay Center, Ohio. The trip is planned for April 22 and 23, 1950.

Our member speaker for this evening was Mr. Carl Stephany, formerly a science teacher of some note in the Cincinnati schools and prior to that in the State of Wisconsin.

His subject "Iron Pyrites and Marcasite" was well chosen for him as both played a part in his early years in Wisconsin. Marcasite nodules being quite common in the region in which he taught, were closely observed and studied along with pyrite which was also quite common. Possibly the most interesting experience to him was the great number of marcasite nodules brought to him as meteorites which the persons finding them had seen strike the earth. His teaching never quite seemed to dispel this belief of the natives.

Mr. Stephany covered very thoroughly in his own inimitable style, all phases of the two minerals, leaving nothing to the attentive listeners imagination.

The specimens and models presented as examples of his statements were well chosen and in each case exhibited the principle involved.

This meeting following the plan of concentrating on fewer minerals and using many hand specimens of them, has again met the approval of all present and will be continued.

Charles L. Gschwind, Sec.
6931 Diana Drive
Cincinnati 24, Ohio

Wisconsin Geological Society

Professor Milton J. Edie, of Carroll College, Waukesha, Wisconsin, presented a review of the new book, "Worlds in Collision" at the February meeting. Mr. Edie a professor of Geology at Carroll College, presented his topic under the name of "Did the Sun Stand Still!"

At the March meeting we had the pleasure of meeting Mr. Edwin G. Cooke, Cinematographer and Traveler of Chicago, who presented his version of "Sarafi through Nature's showcase." After seeing his 35 mm slides and colored movies we can readily understand his great popularity not only from photographic viewpoints, but for the great educational purposes that these pictures serve.

The April meeting was a timely topic presented by the State Geologist, Mr. E. F. Bean. on the subject of water levels and supplies titled, "Ground Water Resources of Wisconsin." Included in the talk were discussions on the problems of New York, California, and other parts of the West.

The W. G. S. banquet will be held May 20th, 1950, at the Y.M.C.A. at 6:15 P.M. The speaker for the evening will be Mr. Elmer R. Nelson Jr., Curator of Geology of the Milwaukee Public Museum, and will also show movies "Rim Rock", a well known production of his taken of the most beautiful scenic spots of Arizona and the boat trip with the late Neville Powell. (Also includes Grand Canyon Country).

Preparations for the National Convention are in full swing. Another Midwest Federation Officer's meeting and Committees to be held at the Schroeder Hotel, April 22nd, 1950.

Miss Libbie Beran
1820 W. Meinecke Ave.
Milwaukee 6, Wisc.

Earth Science Club of Northern Illinois

The recently formed Earth Science Club of Northern Illinois meets on the second Friday each month at 8:00 P.M. in the auditorium of the Avery-Coonley School, Downers Grove, Ill. At each meeting an interesting and instructive lecture is given by a capable speaker, a leader in his field. At the April 14 meeting the lecturer was Dr. Frank Fleener, retired head of the Dept. of Geology of the Joliet Junior College. He spoke on The Quartz Family Minerals. At the May 12 meeting the speaker will be Dr. Gilbert G. Raasch of the Illinois Geological Survey. His topic will be The Geology of The Chicago Region. Visitors are always welcome. Numerous field-trips are being planned for the coming season. The club publishes a monthly bulletin, The Earth Science News, which contains a wealth of information pertaining to the club's six-fold field of interest: minerals, land forms, early man, pre-historic animals. ancient plants and the lapidary arts. The club's membership is drawn from the area west of Chicago to Aurora, and north from the Joliet zone of influence to the Illinois-Wisconsin state line. For further information please contact Stevens T. Norvell, 4449 Howard Ave., Western Springs, Illinois (phone—Western Springs 2832).

Tucson Gem and Mineral Society

At the February 7th meeting of the Tucson Gem and Mineral Society a moving picture, "Crystal Clear," showing the process of growing quartz crystals, and one on Sulphur mining, were shown thru the courtesy of the Telephone Company. Mr. Don Bryant, connected with the Geology Department of the Univ. of Arizona, gave an interesting talk on sedimentary rocks to the society on February 21st. The State Museum of Arizona sponsored a talk by Dean B. S. Butler, February 14th, on his early mineral collecting experiences, which was greatly enjoyed by society members and many others. At the last meeting, March 7th, Mr. David Record discussed cutting and polishing gem materials, showing many specimens, rough and polished, to illustrate his talk. Visitors are welcome to attend meetings on first and third Tuesdays of each month at 7:30 in room 106 of the State Museum Building on the University of Arizona Campus.

David P. Record
4400 Mission Road
Tucson, Ariz.

Chicago Museum Expedition To Texas

The Texas Paleontological Expedition of Chicago Natural History Museum left Chicago, Ill., on Monday, April 3, 1950. Co-leaders are Bryan Patterson, curator of fossil mammals, and Dr. Rainer Zangerl, curator of fossil reptiles. The expedition will be conducted in co-operation with the Texas Memorial Museum of Austin.

The museum men left in a museum truck and will work in a large area surrounding the cities of Dallas and Fort Worth, located in the northern part of the eastern Cretaceous belt of Texas. The expedition has two main objectives: (1) a careful investigation of the Early Cretaceous Trinity Sands in Montague County, where a reconnaisance party of the museum discovered mammalian and frog remains last autumn, and (2) to search for similar deposits south of Montague County and for Late Cretaceous vertebrates mainly in the Eagle Ford Shale and the Taylor Marl (very few vertebrate localities are known in the latter formations). Investigation of the Late Cretaceous deposits in Texas presents a continuation of our program of faunal study of the southern so-called Gulf Series of deposits of late Cretaceous age. The expedition will remain in the field until about the middle of July.

Georgia Mineral Society

Gladys Babson Hannaford, noted lecturer on diamonds, talked to the Georgia Mineral Society March 13, in the Civil Engineering Building at Georgia Tech., Atlanta, Ga., Mrs. Hannaford spoke from a knowledge of diamonds "from the ground up." She recently returned from South African mines with screen pictures that tell the story of the gem from the rock that is blasted out of a "pipe mine" a quarter of a mile deep to the finished gem. Her exhibits contained accurate replicas of the Kohinoor, the Hope, and other historic stones.

The dichroscope and its use in gem testing was the topic studied at the March 20 meeting of the Gem Section. Mr. and Mrs. Nelson Severinghaus combined their talents to present a comprehensive discussion and demonstration of the instrument. Mrs. Severinghaus described early experiments by scientists that led to the discovery of the principle involved in the use of the dichroscope. Mr. Severinghaus discussed the phenomena which enables two colors to be seen by looking at the same portion of a doubly refractive gem and explained how the dichroscope separated the combined colors as seen by the eye.

Quartz crystals by the bucketsful, rose quartz, star quartz, amethyst, and aquamarine were all prize finds of the members attending the April field trip of the Georgia society. The group visited a Troup County collecting site near LaGrange. Sam Knox led the motorcade from Atlanta, and was assisted by Elmer Leach. Three localities were visited. The present owner of the main locality, a Mrs. Smith, said that when her husband first acquired the property about twenty years ago, he frequently "plowed-up" quartz crystals "as long as your arm, doubly terminated."

Erna Mason
State Health Dept.
Atlanta, Ga.

San Diego Mineral and Gem Society

At the San Diego County Fair, Del Mar, California, the San Diego Mineral and Gem Society will display an outstanding collection of cut and uncut gems and minerals, in addition to a complete lapidary demonstration. This display is one of the most outstanding exhibits of the fair week, which is being held this year from June 29 to July 9, inclusive.

The San Diego Mineral and Gem Society, Inc., will also present a display of some of the outstanding mineral and gem collections of society members. This exhibit will be shown at Recital Hall, Balboa Park, October 14 and 15, 1950. No admission charge; visitors welcome.

A. Wayne Oliphant, Cor. Sec'y.
7215 Blackton Drive
La Mesa, Calif.

CAL O GITE — THE SUPER FLUORESCENT

By CAL O. GETTINGS
2001 Starr Ave., Toledo 5, Ohio

Several weeks ago while trimming fluorite and celestite specimens on my diamond saw, I accidentally threw some of the trimmings in the coal pail instead of the trash can. The result was a large clinker, which looked most unusual when removed from the ashes. Being a good rock hound I wondered if it might fluoresce. I tried it and was surprised. It did fluoresce and also phosphoresce. So I tried the accident on purpose. Fluorite xls were carefully put in the stove packed in cold coke so as not fracture them by sudden heat. The result: most interesting. While the color was changed from brown to blue and white they did not fluoresce.

The next week I saw at least a bushel of the old trimmings go through the heat treating process. Finally the mystery was solved. It was not the fluorite that fluoresced. It was the celestite. When fresh, celestite does not react under any light. The explanation is. Celestite is a stable sulphate. When subjected to heat the sulphate is changed to a sulphide which together with unknown activators or foreign substance cause the fluorescence. While the sulphide is unstable the results are most pleasing. The color of reactance under the light is unpredicable. Every specimen is different. To date I can think of no color of the spectrum which has not shown up when subjected to my Conti-Glow lamp. They are also phosphorescent.

For want of a name I did as most any collector would do. I gave it my own. Cal O Gite.

I believe other sulphates might react the same to this treatment. Will someone try barite and let me know?

Just a warning; try this when the wife is away. The resulting sulphide smells like rotten eggs.